Metals Review

THE NEWS DIGEST MAGAZINE

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(Continued on Back Cover)

Metals Review

THE NEWS DIGEST MAGAZINE

RAY T. BAYLESS, Publishing Director — MARJORIE R. HYSLOP, Editor — GEORGE H. LOUGHNER, Production Manager

VOLUME XXII, No. 4 — **APRIL, 1949**

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What's the Catch?...

You can land yourself that better job if you know how to fish in the Sea of Information. A broad knowledge of current developments—both technical and newsworthy—is essential. The skill to get that knowledge must be yours—let *Metals Review* be your equipment.

THERE IS NO CATCH TO THE QUESTIONS BELOW.

They are all based on newsworthy metallurgical developments publicized during the past month. The answers to all of them are found in this issue of *Metals Review*.

Are you well-informed? Find out for yourself by answering these questions. Simply check the right answer, indicate the source in this issue, sign, tear out and mail to Metals Review. If your answer is correct, your name will be published in Metals Review's Honor Roll of the Well-Informed in June.

1. What is found to be an effective material for rocket nozzles operating at 2000 to 2400° F.?
   (a) Oxide porcelain
   (b) Cobalt-chromium alloy
   (c) Chromium-plated graphite
   (d) Zirconia refractories.
   Answer found on page ...., item No. ....

2. How may the heat-affected zone of powder-cut stainless steel edges be minimized?
   (a) By annealing immediately after the cutting operation
   (b) By using a high-carbon stainless steel
   (c) By using a molybdenum-bearing stainless
   (d) By water quenching simultaneously with the cutting.
   Answer found on page ...., item No. ....

3. What is "carbon correction"?
   (a) Adjustment of carbon content for maximum hardenability
   (b) Maintenance or increase of surface carbon to eliminate machining operations on steel bars.
   (c) Treatment of cast iron to render the graphite nodular
   (d) Precipitation of carbides around ferrite crystals to prevent discontinuous yielding.
   Answer found on page ...., item No. ....

4. Grindability of steels is associated with what factor?
   (a) Nature and amount of the carbide phase.
   (b) Nature of the quenching medium used.
   (c) Method of supplying coolant.
   Answer found on page ....

5. Why is a bearing engineer's job simple?
   (a) Because short-time tests reveal bearing failures much more rapidly than was formerly possible.
   (b) Because of the correlation between antiscoring qualities, compressive strength and fatigue life.
   (c) Because all he has to do is to select a material which will transmit the loads required without failure.
   Answer found on page .

6. How can the formability of high-strength aluminum aircraft alloys be improved?
   (a) By prolonged heating just below the age hardening temperature.
   (b) By the addition of 0.5% lithium.
   (c) By rolling or drawing at a temperature of 700° F.
   (d) By heating for a short time in the precipitation heat treatment temperature range.
   Answer found on page ...., item No. ....

7. What is the advantage of the tenacious film of oxide that forms during the casting of aluminum bronze?
   (a) It decreases porosity in the metal by promoting rapid shrinkage.
   (b) It produces a surface of exceptional quality when nonturbulent pouring is used.
   (c) It helps to retain heat in the metal and thus insure a more homogeneous structure.
   Answer found on page ...., item No. ....

8. The new resistance alloy known as Karma is particularly suitable for use under what conditions?
   (a) Extreme variations in temperature
   (b) In highly corrosive atmospheres
   (c) In heavy, rugged equipment built to withstand rough usage
   Answer found on page ....

9. What alloying addition is made to retard "growth" in alloy cast iron?
   (a) 3% copper
   (b) 6% silicon
   (c) 2% magnesium
   (d) 5% chromium
   Answer found on page ....

10. What college recently established an award to recognize achievement in metallurgy by an alumnus?
   (a) Massachusetts Institute of Technology
   (b) Iowa State College
   (c) Pennsylvania State College
   (d) Stevens Institute of Technology
   Answer found on page ....

NAME .... TITLE ....

COMPANY .... ASM CHAPTER ....

MAIL TO METALS REVIEW, 7301 EUCLID AVE., CLEVELAND 3, OHIO

Foundry Practice

By N. H. Keyser

The Year's Developments, Reflected by a Survey of the Literature, Show Progress in Mechanization, Sands, Patternmaking, Gating and Risering, and Foundry Metallurgy

THE FOUNDRY INDUSTRY, like many another, entered the year 1948 grappling with the problems of inadequate supplies of raw materials and the many facets of inflation. Early in the year there were no visible signs that the urgent need for castings could be satisfied. Business, therefore, was good, and when the figures are compiled, the tonnage produced can be expected to come close to the previous year's record high of 16,000,000 tons. About October, the first signs of a decline in the backlog of orders appeared.

The first to note the decline were the small gray iron jobbing foundries. The larger foundries, particularly those supplying automotive castings, have not had so marked a reduction in their backlog of orders. Good operations are still evident in the steel foundries although their backlog has also diminished and some have had to change to other products. The malleable iron industry, with the exception of the shops supplying railroad castings, presents about the same picture as the steel foundries (News note in *Iron Age*, v. 162, Dec. 23, 1948, p. 95; editorial in *Foundry*, v. 79, Jan. 1949, p. 67).

Some raw materials are still continuing in short supply although the over-all picture is much better than it has been at any time since the end of the war. In 1948, the quality of ferrous scrap went up because the steel plants could afford to be more particular, in spite of an all-time record consumption of purchased scrap. The improvement in scrap supplies tended to relieve some of the pressing demand for pig iron (*Steel*, v. 124, Jan. 3, 1949, p. 138-139).

Other factors also helped to increase the availability of foundry pig iron. Numerous blast furnaces which had been shut down for relining and repairs earlier in the year are back in full production. Further relief was obtained by the importation of 49,000 tons of pig iron and by the increased output of domestic producers (25b-96, Jan. 1949).* The four blast furnaces operating with high top pressure have increased production, and more conversions to high top pressure are under way both here and abroad (2b-213, Jan. 1949).

Likewise, better coals for coking have become available. As the stocks of old coal were used up and new washing machines were put into operation, the better quality of the coal began to be reflected in the quality of the coke (25b-96, Jan. 1949).

Mechanization

With foundries handling up to 200 tons of material for every ton of castings shipped and the cost of labor continually going up, even the small foundry has a real interest in mechanization. Gregg shows that with magnet and grab bucket equipment, a 30-ton car of coke can be unloaded at a cost of about 20c per ton against 85c per ton for hand unloading, and a 50-ton car of pig can be unloaded for 12c per ton by magnet against 68c for hand operations (14a-135, Sept. 1948).

How a jobbing foundry rearranged facilities and added new equipment to increase its monthly tonnage from 400 tons to between 800 and 1000 tons without an increase of floor space is an interesting example described by Gude. (14b-39, May 1948). At least 50% of this foundry's production is of a jobbing nature on castings weighing from a few ounces to ten tons, and very few long runs are made.

A new, completely mechanized gray iron foundry is reportedly turning out castings from "cupola spout to box car in 75 minutes" (14b-84, Aug. 1948). At the rate of 275 tons of castings per day, brake drums and clutch housings for passenger cars and trucks roll off two production lines, cleaned and inspected, 1¼ hr. or less after the iron leaves the cupola spout.

A pronounced trend toward the introduction of automatic controls on all types of foundry machinery is exemplified by a completely self-contained molding machine, reported to be the largest in the world (14a-155, Oct. 1948). This unit covers a floor space approximately 48 x 100 ft., and is complete with sand-conditioning and conveying systems, mold conveyors, pouring loop, cooling hoods, shakeout and dust collector systems, and other miscellaneous equipment. A specially designed core blower preforms the molds which are finished to the final dimension with a squeezer.

Because of high labor costs and the scarcity of experienced personnel, the foundry industry is faced with the problem of attracting and selecting the right kind of personnel. As a step in this direction, much time and effort have been expended in "cleaning up the foundry", particular emphasis being directed to the segregation of dust, smoke, and fumes, and to the installation of equipment to minimize worker fatigue. In one instance, the mold cooling line was moved outside the foundry building under a covered passage. Hoods were placed over the exit and entrance of the cooling conveyors to prevent fumes and smoke from returning to the foundry (14b-54, June 1948). In another foundry, a slag disposal system was set up which eliminates heat, dirt, and steam around the cupola (News note in *Foundry*, March 1948, p. 124).

Sands

Among new procedures for controlling and handling molding materials is the use of wood flour (and other similar organic flours) to produce smoother castings with fewer defects. The chief functions of the wood flour are to hold moisture, to generate a reducing atmosphere in the mold cavity and, by reducing expansion, provide a reasonable factor of safety in the degree of ramming of the mold (14a-83, June 1948; 14a-181, Jan. 1949).

Enthusiastic claims have been made for chemically coated sands in the production of superior finishes and reduction of cleaning costs; these claims have been amply substantiated during the past year. (14a-69, June 1948; 14a-177, Jan. 1949). One foundry is using the same chemically coated sand on castings weighing from 4 oz. to 4000 lb. Although used chiefly in gray iron foundries, experiments are being made on applications for casting of other metals.

Synthetic resin core binders have attracted much attention, but their high cost and stickiness have heretofore limited them to the nonferrous foundry where more collapsible cores are imperative. Successful use of resin core mixes in one large gray

* Most of the literature references are cited by the corresponding item number in the Review of Current Metal Literature instead of repeating the entire title, author, and source; this information can be obtained by referring to *Metals Review* for the month indicated.

iron foundry now indicates their applicability for ferrous operations (14b-107, Nov. 1948). This foundry has produced over 3500 tons of resin-bonded cores. Sticking of the sand to core boxes was overcome by the use of a proper release agent and by close control of the factors which influence sticking. Advantages of the resin-bonded core sands are their faster baking time at low temperatures as compared to oil-bonded core sands, improvement in casting finish and reduction in casting defects.

Gating and Risering

The trend towards the application of scientific principles to the gating and feeding of castings is growing. Under the sponsorship of the American Foundrymen's Society, new fundamental data on heat transfer have been derived from a theoretical treatment of experimental results on thermal conductivities of molding sand and solidification studies on steel spheres (14a-72, 14a-73, 14a-74, June 1948).

Caine has made one of the first attempts to put the dimensioning of risers on a theoretical basis (14a-76, June 1948). By formulas based on the heat evolved, heat dissipated, and volume contraction on solidification, the minimum dimensions of a riser which will insure adequate feeding of a casting can be determined. Although his specific equations have been checked experimentally only on steel castings, Caine feels that the method is also applicable to other metals. Proper design of risers so that they will be adequate but not too large should increase casting yields (14A-28, this issue).

A study of the direction in which solidification naturally tends to take place has led to a recent innovation in riser techniques (14b-23, March 1948). Risers of conventional designs, usually in conjunction with William's core and Washburn neck, are centrally or internally located so as to utilize the heat from the surrounding casting to keep the risers hot. Although definitely less feeding metal is required, a set of rules for dimensioning of such risers has not yet been devised. Other advantages claimed for this type of riser are less tendency to form hot cracks and a saving of flask space.

Insulating pads and sleeves, first developed for risers and gates of nonferrous castings to control directional solidification, have now been perfected for use in ferrous molds. Plaster of Paris, the original insulating material used in nonferrous casting, is not adaptable to ferrous casting. An insulating material consisting of diatomaceous earth bonded with bentonite and a small amount of phenolic resin is said to give excellent results with stainless steels and cast irons as well as with nonferrous metals (14A-18, March 1949).

In the field of large castings, such as steel rolling-mill rolls, the problem of risering has been tackled from an unusual angle by electric hot-topping (14b-122, Jan. 1949). In this method the liquid metal in the feeder head or riser is kept molten by an arc formed by two automatically controlled carbon electrodes placed over the feeder head or riser. Exceptionally high yields are obtained.

N. H. Keyser, research engineer in foundry metallurgy at Battelle, is a graduate of Antioch College, with an M.S. in metallurgy from Ohio State. Before joining the Battelle staff in 1941, he was associated with the Ohio Steel Foundry Co. In part of 1947 and 1948 he was engaged in research at the A.E.C. laboratory at Los Alamos, N. M.

High-speed photography of the flow of molten metal into molds may change many existing concepts (14b-102, Nov. 1948). These studies show that finger gates and step gates do not always feed metal in the desired sequence and that no conventional gating system entirely prevents turbulence of the metal. Mezoff and Elliot have studied pouring rates and turbulence of metal flow as affected by gating system design (14a-81, June 1948; also *Transactions of the American Foundrymen's Society,* v. 56, 1948, p. 223-245). Although these tests were made for the benefit of light-metal foundries, much of the results can be applied to the casting of other metals.

A new mold coating is making a notable contribution to the field of centrifugal casting (14a-175, Jan. 1949). The coating is applied by spraying a refractory slurry on the hot metal mold in such a way that the dried coating has numerous small, nubby protuberances which help pick up the molten metal as the mold revolves. This leads to better distribution of the metal in the spinning mold, thus eliminating serious surface defects. The method has been successfully applied to centrifugal casting of a number of metals and composite metals in long tubular shapes.

A German development is the use of a cast iron or steel mold in the centrifugal casting of copper-tin alloys without difficulty from blowholes and general porosity (14c-61, Jan. 1949). The alloys are cast against a dried and degreased sheet of copper used as a liner in the centrifugal mold. The sheet of copper is merely rolled around the inside of the mold with a little overlap, taking care that the overlap is in the proper direction with respect to the direction of rotation. Thickness of the liner is dependent on the size of the casting to be made.

A new high-speed friction saw reduces the cost of removing gates, risers, and other casting trimmings (14a-160, Nov. 1948). Since the heat generated by the saw softens the material to a plastic state, hardened steels are cut with ease. In cutting stainless steels, the life of the friction band is measured in hours rather than minutes. Despite certain limitations as to the thickness of cut, the saw appears certain of wide application.

Metallurgical Developments

A major development with far-reaching effects has been the production of cast iron with a nodular graphite structure. The present knowledge of nodular cast iron is summarized in the leading article in last month's issue of *Metals Review.*

An alloy cast iron that does not "grow" has been perfected by Elsea and White (3b-170, Dec. 1948). Growth resistance is promoted by adding about 6% silicon, while 1¼% copper and ½% chromium enhance the scaling resistance. Parts for heating stoves, home furnaces, gas and oil furnaces are but a few of the possible applications. The high-silicon iron has a decided advantage over other more expensive high-temperature materials in that it is readily made in a cupola in the average foundry.

Composite or dual metals, as they are sometimes called, combine the desirable characteristics of two metals to produce unusual properties for many applications. Higgins discusses the basic principles of producing composite castings and illustrates how, with proper control, a plant making a dual-metal turbine wheel can operate with very low scrap losses (14a-173, Jan. 1949). Vanick and Tanner present engineering data translated from Piwowarsky's work on cast iron reinforced with steel inserts (24b-117, Jan. 1949). Strength may be over 30% greater than would be expected from the combined strengths of the two metals. Composite metal compositions have also been used to develop extra strength and long life in gears (news note in *Steel,* v. 123, Oct. 4, 1948, p. 73). In this application, bronze is cast as a coating over a steel gear wheel.

Tubular shapes combining two concentrically cast metals are readily produced with metallurgical bonds by a modified centrifugal process (14a-175, Jan. 1949).

Bureau of Mines' nonferrous statistics indicate limited commercial reserves of copper, zinc and lead and many helpful suggestions have been made toward the proper utilization of nonferrous scrap and raw materials (14c-59, Jan. 1949; 15a-12, Sept. 1948). Use of nickel as a replacement for tin has become accepted in many engineering applications (news note in *Nickel Topics,* Aug. 1948). As a replacement for tin bronzes, copper-silicon alloys have also come into prominence. Krynitsky, Saunders, and Stern show the influence of pouring temperatures and melting atmosphere on the soundness and tensile properties of copper-silicon alloys (14c-32, June 1948; also *Transactions* of the American Foundrymen's Society, v. 56, 1948, p.152).

Recent metallurgical developments in the light-metals field have provided cast aluminum and magnesium alloys with better resistance to creep at elevated temperatures. In cast aluminum, various alloy additions have been combined with 6% magnesium to improve the elevated-temperature properties (3d-5, March 1948). Cerium and various amounts of zirconium added to magnesium alloys produce high strength, toughness, and higher creep strength (3d-37; 3d-38, Sept. 1948). These new alloys are sure to find application in stressed lightweight components of aircraft engines.

Use of Oxygen

Producers of electric-steel castings have found that a decided saving may be realized by the proper use of oxygen injections, in place of ore, for decarburization. Originally, oxygen injections were believed economical only for decarburization after the carbon had been reduced below about 0.15%. More recently, however, they are being extensively used on stainless and medium-carbon alloy steels to improve the recovery of manganese and chromium from the scrap. At the higher temperatures attained in the absence of ore, the carbon and chromium equilibriums change their relationship enough to permit preferential oxidation of the carbon. This effect is further augmented by the fact that the faster action of oxygen does not allow the chromium to come to equilibrium with the slag (16b-74, Sept. 1948).

The availability of lower cost oxygen has stimulated experimentation on the use of oxygen-enriched blasts in cupolas. At the present time such use is limited by economical considerations to the role of a standby tool for bringing cold iron back to normal or for intermittently obtaining hot iron on short notice. Increasing supplies of cheaper oxygen and additional experimental work in the foundry may eventually make continuous enrichment profitable (14b-70; 14b-76, July 1948).

A New Tool

With the development of low-cost radioactive materials as byproducts of atomic-energy research, an ingenious device has been designed to measure the level of molten metal in the cupola. A radioactive isotope and a Geiger-Muller radiation counter move up and down on slide rails along opposite sides of the cupola; variations in the intensity of the gamma radiation indicate the height of the molten metal (11-243, Nov. 1948). Radioactive sulphur is being used as a tracer to determine some of the fundamentals involved in the production of low-sulphur steels (11-243, Nov. 1948).

In an experiment on actual full-scale operations, radioactive sulphur was added to a batch of coal and was followed through the entire coking process to determine the influence of the original forms of sulphur in coal on the final sulphur content of coke. No preferential removal of either the organic or inorganic forms of sulphur during coking was found. The procedure itself was quite simple and suggests the relative ease and economy by which future experiments of this nature may be run (16a-81, Oct. 1948; 16b-105, Jan. 1949).

Patternmaking

During 1948 the foundry industry gained additional experience with plastic patterns and matchplates (14a-137, Sept. 1948; 14a-115, July 1948). A comparatively new material is called "densified wood." It is an impregnated resin veneer that is harder yet lighter than wood (14A-31, this issue).

A mechanically operated attachment for a pattern milling machine is said to save considerable time in the actual cutting of patterns from wood or soft metals (14a-123, Aug. 1948). The machine produces positive reproductions from full-shaped models or templates. To produce a pattern, a series of templates are clamped together each in its respective position. The assembly is then mounted on a copy table and traced with a copy roller which acuates the milling cutter. The pattern is thereby produced in a series of steps which are conveniently blended by hand. An added advantage claimed for the machine is that right or left-hand patterns can be made from the same set of templates.

Precision Casting

The advantages and limitations of the precision investment casting process have by now been fairly well clarified in the trade press. The precision casting producers have not been content to confine their activities to the making of small castings, and we now find in the literature mention of rotors and stator disks with integrally cast blades, weighing 8 to 12 lb. (14a-136, Sept. 1948; 14b-124, Jan. 1949). Castings weighing up to 20 lb. are being made by a composite-core method in one plant (14a-179, Jan. 1949).

Other endeavors are directed toward decreasing production time and raw material costs. Completely automatic wax injectors for high production runs and more versatile machines for miscellaneous work have been developed. One such wax injector machine contains a central storage which supplies molten wax under pressure through flexible hoses to the various stations. Pneumatic clamps hold the die to the work bench and the supply hose is connected with a Zerk fitting. The machine places no restrictions on die size, position, or mounting (14a-136, Sept. 1948).

Wax may be replaced by other pattern materials, such as in the A.R.D. process, utilizing plastic patterns (14b-100, Nov. 1948; 14a-168, Dec. 1948). This process eliminates precoated patterns and gives a high rate of output. A special low-cost investment material is mixed in semiautomatic equipment and supplied to the investing stations as rapidly as the flasks can be filled. Advantages are lower material costs (one-third as much as suitable wax), facility in production and assembly, and greater stability.

Another novel process employs frozen mercury patterns for investment castings and a fired ceramic shell-like material for the mold (14A-32 and 14A-33, this issue).

Water-soluble ethyl silicate binders should be lower in cost than the present ethyl silicate binders which require organic solvents (14b-124, Jan. 1949). This objective appears to have been accomplished by a new nonsolvent method of hydrolizing ethyl silicate (news note in *Foundry,* Nov. 1948, p. 140).

Technical Society Activities

In September the International Foundry Congress was able to hold its first meeting since World War II. Two international committees have formulated plans for world-wide research and study (announcement in *American Foundryman,* v. 14, Dec. 1948, p. 24).

Reports on several of the research projects authorized in 1946 by the American Foundrymen's Society are scheduled for presentation at the society's annual convention in St. Louis, May 2-5. Studies on heat transfer and solidification of molten metal in sand molds, and on high-temperature testing and properties of sands, have already been completed (announcement in *American Foundryman,* v. 14, Dec. 1948, p. 31).

All signs point to even greater progress in the technology of founding and a greater interest in the fundamental scientific principles.

Compliments

To MARY BAEYERTZ, on being named assistant chairman of the metals research department of Armour Research Foundation of Illinois Institute of Technology. Dr. Baeyertz has been with the Foundation since 1947 as senior metallurgist.

♦ ♦ ♦

To the AMERICAN FOUNDRYMEN'S SOCIETY on its new book "Development of the Metal Castings Industry", which recently was awarded two certificates for superior design and printing—one from the Institute of Graphic Arts, which selected it as one of "50 books of the year", and one from the Society of Typographic Arts, which named it one of the three best books produced during the past year.

♦ ♦ ♦

To A. L. FEILD, associate director of research laboratories, Rustless Division, Armco Steel Corp., on the honorary degree of Doctor of Science conferred by Stevens Institute of Technology.

♦ ♦ ♦

To GEORGE A. ELLINGER, chief of the optical metallurgy laboratory of the National Bureau of Standards, on his election to honorary membership in the society of Sigma Xi, national honorary scientific fraternity.

♦ ♦ ♦

To MAJOR A. E. CARPENTER, president of E. F. Houghton & Co., on the celebration of his 45th anniversary with the company.

Silver Certificates Awarded

Ten Members of the Worcester Chapter A. S. M. (Three of Them Sustaining Member Companies) Were Awarded 25-Year Certificates on Feb. 9, When the Chapter Celebrated "Sustaining Members' Night". Seated, left to right, are: Myles Morgan, vice-president of the Morgan Construction Co., who accepted the award for his company; George W. Coleman; and George H. Campbell, treasurer of Pratt & Inman, who represented that company. Standing, left to right, are: Wilbur C. Searle, Donald Strand, Prof. Carl G. Johnson, Chester M. Inman, and Hermann Klaucke. Victor E. Hillman and the Greenman Steel Treating Corp. were also awarded silver certificates. Robert S. Morrow, chairman of the Awards Committee, made the presentations. Technical speaker was Fred P. Peters, editorial director of Materials & Methods. Speaking on "Broad Trends in Materials and Their Uses", Mr. Peters compared prices of materials in the metallurgical field and illustrated many new uses to which metals and plastics are being put. (Reported by C. Weston Russell, Wyman-Gordon Co.)

Design Engineers Lack Basic Research—Horger

Reported by J. C. Selby
Metallurgical Dept.
Timken Roller Bearing Co.

"Why Metals Fracture" was discussed from the viewpoint of the designer, rather than that of the metallurgist before the January meeting of the Canton-Massillon Chapter A.S.M. The speaker was O. J. Horger, chief engineer of the railway division, Timken Roller Bearing Co. He discussed in detail the two factors which the design engineer must know, namely, the stresses imposed on a part in service and the strength of the material under the conditions of service.

Dr. Horger is of the opinion that neither of these factors is as well understood as it should be, largely due to lack of theoretical or basic research in this country. Both factors are now being studied and our knowledge of them is being amplified. Two examples are the application of SR-4 strain gages to the measurement of actual stresses on parts in service, and the testing of full size parts, rather than conventional samples. Both of these methods give a more accurate prediction of how a part will perform in service than the customary physical tests in small samples.

Dr. Horger also discussed in some detail the problems of stress measurement, and the correction of unfavorable stress conditions that often occur in service.

Previous to Dr. Horger's talk, Sam Keener, president of the Salem Engineering Co., gave a talk on the European situation, based on a recent business trip to the continent. A discussion period led by R. L. Wilson of the Timken company completed the meeting.

Toolsteel Developments Are Along Consumer Lines

Reported by F. R. Lorenz, Jr.
Pennsylvania State University

J. P. Gill, executive vice-president, Vanadium-Alloys Steel Co., spoke on "New Developments in Toolsteels" before a recent meeting of the Penn State Chapter, A.S.M. Following the newly established program for this year, in the afternoon Mr. Gill addressed undergraduates in the metallurgy curriculum, presenting an excellent summary of opportunities and possibilities for metallurgists in the field of toolsteels.

In the evening, Mr. Gill spoke to the chapter, covering the major developments and trends in the use and treatment of toolsteels in the years since the conclusion of the war. Development has progressed primarily along the lines of consumer interest, Mr. Gill pointed out, and described research on the effect of subzero treatments, new tempering techniques, the effect of chemical composition and a multitude of other things. An important consideration, he said, is the methods used in testing toolsteels and just what correlation and significance exists between the tests and the characteristics of the steel.

Recovery of Various Metals From Sea Water And Ocean Bottom Predicted

Reported by Harry A. Johnson
Gear Engineer
Aircooled Motors, Inc.

"Some Recent Developments in Nonferrous Metallurgy" were detailed by Bruce W. Gonser, supervisor of nonferrous metallurgy for Battelle Memorial Institute, before the February meeting of the Syracuse Chapter A.S.M. Dr. Gonser used slides to illustrate the relative abundance in the earth's crust of the whole range of known metals from silicon to radium.

Other metals than magnesium will probably be recovered from sea water in the future, the speaker predicted, and still others—particularly manganese—will probably be obtained from the bottom of the ocean.

A metal of special interest is titanium. Although quite abundant, it is costly to refine by present methods, particularly to the purity required for dependable research work. It is expected to become increasingly important both as an alloy and in its own right, as it becomes more generally available and its potentialities become better known.

Temperature limitations of the more common metals and alloys were illustrated, as well as the alloys that have recently been developed for high-temperature service. Considerable research work at Battelle is being directed toward the discovery of alloys for special purposes, including the high temperatures required by gas turbines and similar applications.

Dr. Gonser displayed samples of many of the metals known to most of his audience only by name, if at all. It was "standing room only", and not much of that in the vicinity of this display after the lecture.

President Work Visits Detroit

A.S.M. President Work (Right) Congratulates Walter Jominy on Presenting the Retiring Trustee's Medal

Reported by R. M. McBride
Universal Products Co., Inc.

Detroit Chapter observed National Officers' Night on Feb. 14. President Harold K. Work gave a brief report on the affairs of the society and the lighter side of life as proxy for Mr. Eisenman who was unable to attend.

Dr. Work then discussed "Some Factors Affecting Behavior of Steel During Cold Working". The principal problems considered were the influence of nitrogen and phosphorus on the behavior of steel during cold working, aging characteristics as affected by nitrogen and phosphorus, and deoxidation practices necessary to reduce the sensitivity of steel to cold work.

Walter E. Jominy, staff engineer, Chrysler Corp., introduced the president and conducted the discussion following the lecture. Prior to the lecture Dr. Work presented the Trustee's Gold Medal to Mr. Jominy.

Douglas Roby of the U. S. Olympic Association gave a dinner talk, telling of Detroit's hopes for obtaining the Olympic Games in 1956.

The Reviewing Stand

WHAT IS "metallurgy"? Webster defines it as "the science and art of extracting metals from their ores, refining them and preparing them for use. It includes various processes, as smelting, amalgamating, electrolytic refining, rolling, heat treating, etc."

Webster can hardly be blamed for ending his definition with that handy little catch-all "etc." At least, the Literature Classification Committee* will gladly concede him indulgence for this lack of precision, after chalking up many man-hours in an attempt to convert that "etc." into the niceties of scientific terminology.

While the task of the Literature Classification Committee is not necessarily to define "metallurgy", it is a foregone conclusion that the finished classification will provide far more specific and comprehensive limitations to the term than does Webster's definition.

What this committee *does* hope to accomplish is a classification system with a three-fold purpose:

1. To provide a logical and fairly simple breakdown of the entire metallurgical field which can have universal applications in classifying the literature.
2. To serve as a guide for a punch card filing system that can be used by the individual metallurgist or research worker for his own data collections.
3. To be used as a pattern for classifying the abstracts published in the A.S.M. Review of Metal Literature.

This is a pretty large order, and conflicts between the three purposes are inevitable; yet after several months' deliberations and some heavy-going discussions, the consensus is that the three purposes are not irreconcilable, and a workable compromise can be effected.

Indications of the need for such a scheme have come from several sources and are not confined to the American Society for Metals nor even to American metallurgists and librarians. Announcement of the formation of this committee last winter, for instance, aroused the following editorial comment in the British publication *Metal Industry*: " . . . . In the abstracting field itself we, in this country, are already well served, but we feel that the majority of metallurgists would agree with their American counterparts that a standardized punch card system is long overdue. Is not this an opportunity for our own metallurgical institutes to cooperate with the A.S.M., and by obtaining the consensus of opinion in this country facilitate the adoption of an international standard of classification of metallurgical literature?"

That, in turn, stimulated the Italian Association of Metallurgy to contribute its bit toward international cooperation by offering to the A.S.M. committee a translation of its classification, devised some three years ago.

These evidences of world-wide interest in the problems of rendering the huge bulk of technical literature more readily available to the individual scientist are welcome and gratifying, and future cooperation will be actively sought by the Literature Classification Committee as soon as it is able to get its preliminary outline ready for circulation.

M.R.H.

* Sponsored jointly by the American Society for Metals and the Special Libraries Association.

Many Honored at Los Angeles Silver Jubilee

The Silver Jubilee Anniversary Dinner of the Los Angeles Chapter A. S. M. Was Highlighted by the Presentation of Many Honor Certificates to Past Chairmen and Officers as Well as 25-Year Members. Left to right in the large photograph are Wm. W. Farrar, past chairman and co-master of ceremonies; Ben Gray (standing), chairman of the Entertainment Committee; Tony Kabutsch, entertainer; James H. Knapp, past chairman and co-master of ceremonies; E. R. Babylon, chapter chairman; Fred J. Robbins, past chairman and national A.S.M. trustee; and James B. Morey, chapter vice-chairman and chairman of arrangements for the Silver Jubilee. In the inset are Wm. J. Parsons, secretary-treasurer of the chapter for ten years, and National A. S. M. Secretary W. H. Eisenman.

Better Understanding Needed Between Management and Metallurgists, Says Editor

Reported by A. A. Bradd
Assistant Superintendent of Research
Midvale Co.

"Metallurgists and management need more comprehension and understanding of each other's functions and problems," said Fred P. Peters, vice-president of Reinhold Publishing Corp. and editorial director of *Materials & Methods*, in a talk on "Management Looks at the Metallurgist and Vice Versa" before the Sustaining Members' Night meeting of the Philadelphia Chapter A.S.M.

"Executives," he said, "should learn that the metallurgist is a trained engineer who can save thousands of precious operating dollars each year if they will try to understand his lingo and put more of his talents to work. Metallurgists, for their part, must develop simultaneously a respect for mere non-technical achievements and a greater familiarity with production economics.

"The average metallurgist regards his management as well-meaning, but in the dark about technical matters", Mr. Peters continued, and cited several examples of almost complete lack of familiarity on the part of management about facts that are common knowledge to metallurgists. "Discouraging to the metallurgist," he added, "are the occasionally unreasonable demands placed upon him for speed in developing a needed material or in solving a knotty problem. Metallurgists also often complain about being insincerely treated by some managements like so much technical window dressing."

Turning to the management's view of the metallurgist, Mr. Peters said: "Most metalworking management is without metallurgical help, is unclear as to its nature and certainly unaware of its great value. In companies having a metallurgical department, management usually regards the metallurgist as a brainy fellow, inclined to be a bit academic from the standpoint of production economics and not as good a writer or speaker as one of his education ought to be."

Mr. Peters estimated that "there are more than 6000 medium-size to large plants making engine and machine parts, electrical appliances, castings, and hardware, which operate without benefit of metallurgical control or research. If they would, these companies could each extract as much profit from a materials or metallurgical department as do their wiser brethren who do have such departments," he said.

"However, most of the foregoing attitudes represent those of some but not all managements. A large segment of industrial management is 100% sold on the metallurgist, enthusiastic about his contributions and is promoting his utilization to the limit.

"Industrial management, for its own good, should make greater use of metallurgists, either for research, process control or materials engineering, than it now does. Where the metallurgist is found in our large metalworking and metal producing companies and in all well-managed outfits, management's attitude toward him, despite his occasionally long hair, is much healthier than the average metallurgist realizes. Such management has the greatest possible respect for the metallurgist's considerable contribution to industry and to the basic science that provides industry with its technological raw materials."

Chattanooga Hears Croft

Reported by George T. Richardson
Noland Co., Inc.

National Officers' Night of the Chattanooga Chapter A.S.M. on Feb. 2 was featured by a visit from Harry P. Croft, A.S.M. trustee. Earlier in the day Dr. Croft met with the chapter executive committee for lunch and then made a tour of the Combustion Engineering Co.

At the evening meeting, Dr. Croft, who is vice-president in charge of developments at the Wheeling Bronze Casting Co., gave a report of the activities of the national office, and also discussed physical properties of high-strength corrosion resistant bronzes.

Annual Award To Honor Name of Prof. McFarland

Reported by F. R. Lorenz, Jr.
Pennsylvania State College

An annual award designed to honor an outstanding Penn State metallurgist has been instituted by the Penn State Chapter A.S.M., to be known as the "David Ford McFarland Award for Achievement in Metallurgy".

D. F. McFarland

The award will recognize the attainment of eminence in the metallurgical profession in such a manner as to bring credit upon the recipient and upon his alma mater. The award will thus achieve several goals: (*a*) it will constitute a public recognition of an individual of merit; (*b*) it will serve as an inspiration to students and young graduates; (*c*) it will honor Penn State by directing attention to her able alumni.

Presentation of the award will be made annually in connection with the May meeting of the chapter. The recipient will present the principal address at this meeting, in addition to receiving an engraved certificate as evidence of the award. A plaque, on which the recipient's name will be engraved, will be kept by the School of Mineral Industries.

The David Ford McFarland Award will not only honor Dr. McFarland, but also lend to this new activity the dignity of his good name—the name longest and most closely associated with metallurgy at Penn State, where he was head of the department of metallurgy for many years. It is especially noteworthy that Dr. McFarland will be present to make the first award in person.

First recipient at the Penn State Chapter meeting next month will be George V. Luerssen, chief metallurgist of the Carpenter Steel Co. He will thus be honored for his invaluable contribution to the development and to the splendid reputation of the Carpenter Steel Co., his active leadership in the metallurgical profession, and his personal record as a man and a citizen.

Following a banquet and presentation of the certificate, Mr. Luerssen will give the technical address of the evening, on the subject of "Iron-Nickel Alloys". The discussion will be confined to alloys of the reversible type, above 29% nickel—a subject that Mr. Luerssen believes needs metallurgical attention.

Common Use of Titanium Metal Will Await Cheaper Production Methods — Stewart

Reported by W. S. White
Johnson Wire Works Limited

Titanium was the subject for the February meeting of the Montreal Chapter A.S.M., and R. S. Stewart, assistant chief, physical metallurgy, Titanium Alloy Division, National Lead Co., was the speaker.

Titanium is the ninth most common element on the earth's surface, Mr. Stewart said, but because of its unfortunate affinity for other elements it is never found in the pure state. In fact, it has such a propensity for uniting with other elements and compounds when in the molten state that it might almost be said to be the long-sought "universal solvent".

Large and important titanium ore bodies are to be found on most of the continents of the world. The recently discovered ore deposit in Quebec is one of those which will be developed in the immediate future. Six large electric smelters will be built at Sorel, P.Q. These will produce a considerable tonnage of titanium oxide for paint pigments and a slightly smaller tonnage of high-grade iron, which will presumably be used by the steel and iron industries of the St. Lawrence valley.

Titanium also is of increasing value as an alloying element in metals, and small quantities will refine the grain and improve the physical properties of aluminum, copper, magnesium, steel, nickel and others.

Various articles have appeared in the press which would lead one to believe that titanium will perform wonders and will immediately take the place of more common metals for innumerable applications. Mr. Stewart believes that these ideas are, to put it mildly, premature. Titanium does unquestionably have very desirable properties but, to date, the largest ingot which has been cast is approximately 100 lb. of fairly pure metal (over 99%). This would seem to be a fairly sizeable ingot but unfortunately the price is still high for metal of this or higher purity. Furthermore, small quantities of impurities in the form of carbon, hydrogen, and particularly oxygen or nitrogen will adversely affect the physical properties of the metal. All of the methods for producing titanium of high purity are difficult and costly.

Most of the current work is following along more or less traditional methods used for preparation of metals for powder metallurgy, and metals of 99.9% purity, or better, have been produced at great cost. The main difficulty in melting lies in developing a satisfactory refractory for the melting crucible which will offset the affinity which titanium has for other elements. When this refractory is found, and when production methods have been developed which will enable the extraction to be carried out at a reasonable cost, then, and not until then, can we look forward to the common use of titanium as a metal.

Before the technical session, a film entitled "Hacksaws and How to Use Them" was presented by the Simonds Canada Saw Co., Ltd.

Columbus Has Officers' Night

Seated Clockwise Around the Table at National Officers' Night of the Columbus Chapter A.S.M. Are: S. Yost, Chapter Treasurer; J. Gow, Vice-Chairman; M. Fontana, Chairman; H. K. Work, A.S.M. National President; S. L. Hoyt, 25-Year Member; and Ernie Christin, Secretary. Dr. Work spoke on work sensitivity of steels, and Dr. Hoyt was awarded a silver certificate. A minstrel act by the Battelle Players livened the dinner and Leroy Fink won the radio given for the best amateur exhibition

Metals Review's Honor Roll of the Well Informed

The following readers returned correct answers to the quiz page in the February issue of Metals Review. To earn a place on this honor roll, turn to page 4 and test your own knowledge of current events in the metal industry.

J. L. Abbott, research engineer, A. O. Smith Corp.; Mervin S. Allshouse, Jr., student engineer, National Tube Co.; Tryggve Angel, metallographer, Avesta Iron & Steel Works, Sweden.

Edward L. Badwick, graduate student, Polytechnic Institute of Brooklyn; Adam W. Baer, Cleveland; E. A. Baines, sales representative, Alloy Steel Products Co.; Richard D. Bardes, sales engineer, Vanadium-Alloys Steel Co.; William S. Bath, metallurgist, Curtiss-Wright Corp.; R. I. Benford, Jr., metallurgical laboratory assistant, Duraloy Co.; E. T. Bergquist, metallurgist, Western Gear Works; Dale Bittinger, assistant superintendent, sheet mill dept., Jessop Steel Co.; George Blowers, MacInnes Steel Sales Co.; W. W. Brenneman, metallurgical dept., Lime-Hamilton Corp.; James C. Buchanan, inspection engineer, Canadian Westinghouse Co., Ltd.; F. E. Busemann, chemist, E. I. DuPont de Nemours & Co.

J. D. Carey, metallurgical engineer, General Electric Co.; Victor Caron, metallurgical engineer, Canadian Bureau of Mines; Keith Charters, salesman, Harrington Tool & Die Co., Ltd.; R. E. Christin, chief metallurgist, Columbus Bolt & Forging Co.; Walter H. Clark, metallurgist, LeRoi Co., Cleveland Division; Eugene S. Clarke, metallurgist, United Shoe Machinery Co.; Rinaldo M. Curcio, metallurgist, Permo, Inc.

Gerard J. Davidse, metallurgist, Allegheny-Ludlum Steel Corp.; Gerrit DeVries, metallurgist, U. S. Naval Proving Ground; Richard H. Dexter, Dexter Equipment Co.; R. B. Durfee, Jr., field engineer, A. F. Holden Co.

C. L. T. Edwards, sales metallurgist, Bethlehem Steel Co.; P. Leckie-Ewing, metallurgist, Union Twist Drill Co., Butterfield Division.

James L. Foster, metallurgist, Goodyear Aircraft Corp., Wheel & Brake Division.

Frank Greco, assistant metallurgist, Sperry Gyroscope Co.

Louis B. Haberman, metallurgy instructor, Samuel Gompers High School; E. A. Hall, heat treat foreman, Schwitzer-Cummins Co.; K. Stanley Hawkins, mechanical engineer, U. S. N. Cleveland Diesel; Kenneth E. Hess, chemist, Ladish Co.; Louis W. Hille, instructor, machine shop, School District of Philadelphia; P. S. Hoffman, metallurgist, Treadwell Engineering Co.; T. S. Howald, chief chemist, Chase Brass & Copper Co., Inc.

H. M. Irvine, heat treating foreman, Pitney-Bowes Inc.; H. Richard Irwin, metallurgical engineer, Babcock & Wilcox Tube Co.

C. H. L. Jones, chemist, Toronto.

Walter C. Kahn, assistant technical director, N. Y. Testing Laboratories; Leslie C. Kantner, Jr., research engineer, Lockheed Aircraft Corp.; David A. Kassner, student, Pratt Institute; A. M. Kazimer, research engineer, Superior Zinc Corp.; Aaron J. Keeperman, M. E. senior, Pratt Institute; Ralph Kennedy, research metallurgist, Cleveland Twist Drill Co.; John E. King, metallurgist, Heintz Mfg. Co.; Anthony Klinshaw, hammerman, Worthington Pump & Machinery Corp.; Alfred S. Kos, engineer, Barth Stamping & Machine Co.

Paul J. Landgraf, student, Case Institute of Technology; Val Lazar, metallurgist, Philadelphia Naval Shipyard; John C. Lehmann, heat treat tool expert and straightener, Kaiser-Frazer Corp.; W. H. Leitton, manager, Electrical Products Division, United States Time Corp.; C. H. Lekberg, superintendent industrial gas, Northern Indiana Public Service; Robert St. Clair Low, powder metallurgist, Baker & Co., Inc.; H. H. Lurie, chief metallurgist, Cummins Engine Co.

Milton Male, research engineer, U. S. Steel Corp.; James H. Marshall, metallurgist, Seeger Refrigerator Co.; D. E. Matthieu, assistant to superintendent, American Brake Shoe Co.; George A. Mayer, Jr., shop practice engineer, Malleable Founders Society; Robert P. J. McCarty, treasurer, Robert P. J. McCarty & Sons Co., Inc.; E. E. McLaughlin, sales engineer, Dominion Oxygen; Blake D. Mills, Jr., engineering professor, University of Washington.

Clarence Nelson, metallurgist, Republic Steel Corp.; E. L. Novomesky, metallurgist, Wright Aeronautical Corp.

G. Birger Olson, engineer, Works Laboratory, General Electric Co.

Charles H. Parcells, metallurgical technician, International Harvester Co.; Alfred Pasler, chief heat treater, Alfred Hoffman; Tracy W. Peck, general foreman, Caterpillar Tractor Co.; David W. Pettigrew, Jr., research engineer, Aluminum Research Labs.

Robert H. Raymond, sales engineer, Eagle Metals Co.; J. G. Rivet, metallurgical engineer, Canadian Car & Foundry Co.; George Robinson, student engineer, General Motors Corp.; Preston Rutledge, chief engineer, Caterpillar Tractor Co.

Frank J. Satter, sales engineer, Sandvik Steel Inc.; Richard Schmidt, laboratory technician, Westinghouse Electric Corp.; R. E. Sheffer, assistant works manager, Aluminum Co. of America; G. H. Silver, metallurgist, Monarch Machine Tool Co.; A. P. Simpson, Simpson Motor Co.; A. W. Stolzenburg, process and products engineer, Aluminum Co. of America; H. T. Sumsion, research assistant, University of Utah; C. B. Swander, chief metallurgist, Wagner Electric Corp.

H. G. Thompson, quality engineer, Master Electric Co.; R. C. A. Thurston, metallurgical engineer, Bureau of Mines (Canada); Everett R. Turner, special trainee, Algoma Steel Corp., Ltd.

James O. Vadeboncoeur, foreman, Pontiac Motor Div., G. M. C.; Greswold Van Dyke, metallurgist, H. & B. American Machine Co.; S. B. Voorhees, works metallurgist, International Harvester Co.

F. Richard Weaver, research engineer, Haynes Stellite Co.; C. W. Werth, metallographer, Atlantic Steel Co.; W. Hughes White, metallurgical engineer, Hoyland Steel Co.; Dean N. Williams, student, Michigan College of Mining and Technology.

Turn to page 4 for this month's quiz

Named Technical Director Of Engineering Foundation

Frank T. Sisco, director of Alloys of Iron Research, has been appointed technical director of the Engineering Foundation. The Foundation, joint research agency of American Society of Civil Engineers, American Institute of Mining and Metallurgical Engineers, American Society of Mechanical Engineers, and American Institute of Electrical Engineers, sponsors and supports fundamental research in all fields of engineering.

F. T. Sisco

Mr. Sisco was educated at the University of Illinois; he served for ten years in the operating departments of various steel companies and for seven years as chief of the metallurgical laboratory of the U. S. Army Air Corps at Wright Field, Dayton, Ohio. He has been in charge of Alloys of Iron Research since 1930 and for the present he will continue with this project in addition to his duties as director of the research activities of Engineering Foundation. He is the author of several books, articles and technical papers.

Mr. Sisco is a former national trustee of the American Society for Metals, and at one time was secretary of the Metals Divisions of the American Institute of Mining and Metallurgical Engineers. He is currently serving on the Literature Classification Committee sponsored jointly by the A.S.M. and the Special Libraries Association.

N. J. Has Verbal Tour Through Stamping Plant

Reported by James M. Loiacono
Eclipse-Pioneer Div., Bendix Aviation Corp.

A verbal tour through a modern stamping plant was conducted by Walter Baird, general manager of the Toledo Pressed Steel Co., for the members of the New Jersey Chapter at their February meeting.

Step by step, Mr. Baird described the sequence of operations in designing and making dies for pressed metal parts. The importance of dies of adequate size with proper clearance was emphasized; in Mr. Baird's plant, selection of kind of steel to be used for a particular die is left to the judgment of the toolroom supervisor, who has the responsibility of making it do the job.

Many intricate stamping and forming problems were illustrated with actual parts. In language all could clearly understand, the background of various jobs, steps involved in designing the necessary dies, and sequence of stamping and forming operations were presented. Projection welding is being increasingly used in building complicated assemblies from two or more pressed steel parts, according to Mr. Baird.

In a lively discussion period, he drew freely on his vast store of practical experience to pass along many tips that listeners could use in solving their own problems.

Opens New Office on Coast

Precision Scientific Co. of Chicago, makers of scientific research and product control apparatus, has opened a branch office in San Francisco. Walter A. Blair has been placed in charge, with offices at 582 Market St., San Francisco, 4. Mr. Blair was a product design engineer with the Fansteel Metallurgical Corp. before coming to Precision Scientific Co.

Heat Treat Quiz Draws Record Attendance

Pittsburgh Chapter's Heat Treating Quiz Panel at the February Meeting Consisted of (Left to Right): George M. Synder of Woodings-Verona Tool Works, Inc.; A. M. Cox of Pittsburgh Commercial Heat Treating Co.; E. J. Pavesic, Lindberg Steel Treating Co.; H. C. Amtsberg, Westinghouse Electric Corp.; and J. R. Gier, Jr., of Ferrotherm Co.

Reported by J. B. Donaldson

Many Pittsburgh Chapter members apparently have perplexing heat treating problems, for the Feb. 10 "quiz" program on this subject shattered all attendance records to date this year.

A number of practical ideas on heat treating were exchanged and debated with vigorous audience participation, ably refereed by interlocutor Charles F. Pogacar. The panel of experts included G. M. Snyder, A. M. Cox, E. J. Pavesic, H. C. Amtsberg, and J. R. Gier.

Subjects discussed by these experts involved relative cooling speeds between brine and water; degree of cooling of oil hardening steels from the standpoint of minimum warpage and maximum property; the desirability of removing steels from their quenching baths prior to complete cooling. Animated discussion also evolved around the types of protective compounds. Various salt baths, controlled-atmosphere furnaces and solid pack compounds also had their innings.

As might be expected, the inherent hardenability of steels was given a whirl. Least agreement on the part of the panel concerned the subject of stress relieving. The question and answer period was concluded with a heated discussion of relative importance of oil temperature versus type of oil used.

The questions and answers were halted in time for the colored movie, "Heat Treating Hints", prepared by Lindberg Steel Treating Co.

Bearing Engineer's Problem Simple Says Underwood

Reported by G. F. Kappelt
Metallurgist, Bell Aircraft Corp.

A bearing engineer's problem is simple. All he has to do is to select a material which will transmit the loads required without failure! So said Arthur F. Underwood, head of the mechanical engineering department, research laboratories, General Motors Corp., in a talk before the Buffalo Chapter A.S.M. at the February meeting.

In the few short years that modern bearing engineering has been practiced, many qualities or properties have been segregated. This segregation of qualities has led to such a substantial reduction in the number of bearing failures that we are prone to forget the problems connected with their selection. Anti-scoring, compressibility, fatigue life, all must be considered. One minor problem is the mere fact that the materials with the highest anti-scoring qualities do not possess the best compressive strength nor does the material of highest compressive strength possess the best fatigue life.

Because of the fact that no one material is at the head of the list on all quality points, every bearing selection job is a compromise of desired values. And after a bearing is selected for theoretical reasons, then it must meet certain functional qualities, such as embedability (of dirt), corrosion resistance, and conformability or standing up under actual working conditions.

Presenting numerous slides, Mr. Underwood showed the engines and test machines used in the General Motors laboratory for the evaluation of bearing materials. It was gratifying to hear Mr. Underwood complain that his job is becoming increasingly difficult because it is taking longer and longer to obtain test data. Whereas yesterday a bearing would fail in 8 to 24 hr. on his bearing tester, today many hundred hours under much higher loads are needed for failure.

New Rocky Mountain Secretary

J. F. Musgrove, who is leaving Denver to join Crucible Steel Co. of America in Los Angeles, has resigned as secretary of the Rocky Mountain Chapter A.S.M. William J. Holtman of Denver will serve as secretary of the chapter until the election of new officers in May.

THIRTY YEARS AGO

After a short life as independent organizations, the Steel Treating Research Society and the American Steel Treaters Society merged in 1920 to form the present American Society for Metals. The early issues of the official publications of these two societies (1917-1920) are filled with nostalgic and historical associations.—Ed.

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An early article on "The Art of Heat Treating" gives general information about "the most prominent alloy types". These are listed as nickel steel, chrome-nickel steel and chrome - vanadium steel. "Chrome-nickel," says the author, "is probably the best known and most widely used of any of the alloy steels, as it has been the most widely advertised and exploited." . . . Of the third type, however, he says, "Chrome-vanadium is a universal alloy steel and stands forth unmistakably as the Master Alloy."

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In an editorial entitled "Do You Advocate the Use of Chrome-Vanadium Steel?" the editor invites "anyone who has different views on this subject to express himself".

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Under "Current Society Matters" an "important announcement" states that: "The Board of Directors have secured a business manager to devote his entire time to the furtherance of the objects of our society and to handle the office affairs pertaining thereto, in the person of Mr. William H. Eisenman."

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A personal item states that "L. F. MULHOLLAND has moved from Richmond, Va., to Schenectady, N. Y., to take up work as assistant engineer of tests with the American Locomotive Co." Mr. Mulholland was still with this company at the time of his death a few months ago. He was a charter member and first chairman of the Schenectady Chapter (now known as Eastern New York).

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CHARLES MORRIS JOHNSON of Crucible Steel Co. of America, Pittsburgh, is listed among the new members in April 1918. (For more recent news about Mr. Johnson, see his biography among the recipients of "Distinguished Service Awards" in the March 1949 issue of *Metal Progress.*)

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A note in the *Journal* in 1918 states that the October meeting of the Chicago Chapter was postponed because of the epidemic of Spanish influenza.

Grindability Associated With Steel Structure

Reported by Morris Cohen
Massachusetts Institute of Technology

Grindability of hardened toolsteels is a field of considerable industrial importance, and was one of the first of the "Grinding Problems From the Metallurgical Viewpoint" tackled by L. P. Tarasov of the Norton Co., speaking before the February meeting of the Boston Chapter A.S.M.

Wheel wear per unit material removed has been found to be over 100 times as great for a toolsteel of low grindability as for one of high grindability. These large differences in the grindability of steels, all in the same hardness range, are apparently associated with the nature and amount of the carbide phase. Vanadium is the most important single alloying element in this respect, the grindability of high speed steels decreasing rapidly with increasing vanadium content on account of the extreme hardness of vanadium carbide. Toolsteels can be placed in five or six grindability groups. Water, oil and air hardening steels may be found in the same group so that the quenching medium used does not predict the grindability.

Grinding sensitivity, or susceptibility to cracking in grinding, is another metallurgical problem, a primary cause of which may be retained austenite; experiments still in progress on 52100 steel strongly support this idea.

Another metallurgical aspect of grinding is the effect of excessive grinding heat on the microstructure of hardened steel. Severe grinding conditions are likely to generate high momentary surface temperatures, which result in overtempering and, if high enough, in rehardening. The former gives rise to soft skin, the latter to brittleness as a result of the untempered nature of the freshly formed martensite.

Techniques of trouble shooting to investigate actual grinding problems involving hardened steel have become fairly well known. Surface cracks are best detected by the magnetic particle method, but if this is not available, then a weak nitric acid etch will do.

Numerous factors may contribute to surface injury. Of the metallurgical ones, improper carburizing practice is now the most frequent cause of grinding difficulty. Too high a carbon content at the surface, with a resultant massive or network carbide structure, makes the steel crack easily even when ground gently. High speed steel used to give a great deal of trouble in grinding because of its propensity toward cracking, but the current practice of double tempering has virtually eliminated this difficulty.

The coffee talk was given by Past Chairman and Former Trustee E. L. Bartholomew on the "Early History of American Steelmaking". He described the operation of the first iron works in this country at Saugus, Mass., and urged support for the rebuilding of the old blast furnace and mills as a shrine to the "cradle of the American iron industry."

Another feature of the evening was the awarding of silver certificates to 25-year members.

Left to Right at Boston Chapter's February Meeting Are F. W. Smith of D. A. Stuart Oil Co., Who Acted as Technical Chairman; L. P. Tarasov, Principal Speaker; and L. Geertz, Chairman. (Photo by H. L. Phillips)

Savage Enumerates 11 Purposes Served By Electroplating

Reported by R. Carson Dalzell
Chief Technical Advisor
Revere Copper and Brass, Inc.

Eleven different purposes for electroplating were enumerated by Frank K. Savage, past supreme president of the American Electroplaters Society, speaking before the February meeting of the Rome Chapter A.S.M. A nationally known consultant and owner of the Star Silver Plating and Mfg. Co., Savage said that plating is used for such various purposes as corrosion protection, beautifying, salvaging, molding, airplane bearings, stop-off for carburizing, lubrication before drawing, porous deposits for heavy-duty bearings, wear protection on printing plates, metal refining, and armor protection of nonmetallic articles.

Copper and gold are the only two metals which have color—naturally an important consideration in decorative plating. Copper and nickel are the important basic coats.

It is only during the last 20 years that real progress has been made in increasing the speed of plating. Nickel-plating a modern automobile bumper has been accelerated at least 30-fold over the old double-salts method, which required 6 to 7 hr.

Temperature, current density, dilution, and addition agents affect the throwing power of various plating baths. A bright polished surface itself enhances throwing power, he remarked.

Savage feels that manufacturers in the postwar period have forgotten some of the lessons learned during the war. As an example he cited hard chromium plating, particularly on cutting tools. In a plant employing 3000 men during the war savings of over $35,000 per month were effected by hard chromium plating gages and tools.

Tin can consumption is increasing steadily, and at least one mill is plating 30 to 36-in. wide strip at a rate of 1100 ft. per min. in a continuous operation.

The technical talk was preceded by E. F. Metcalf, secretary of the Utica Chapter of United World Federalists. This organization advocates revision of the United Nations Charter to provide for a federation of nations as a real world government. A world government with authority over the individual is offered as the only new idea which offers any hope of permanent peace.

President Speaks at Ottawa

Reported by A. R. Deir
Dominion Bureau of Statistics
Department of Trade and Commerce

The annual dinner meeting of the Ottawa Valley Chapter A.S.M. was addressed by Harold K. Work on March 8. The national president's topic was "Some New Developments in Steelmaking", which has been presented before many A.S.M. chapters during the current season.

In a coffee talk on industrial relations, John S. Scott emphasized the fact that the first impressions of a new employee in industry have a lasting effect, and have a direct bearing on labor turnover.

Among those seated at the speakers' table were Chairman G. T. Burgess, Dr. J. Convey, and Secretary N. B. Brown.

Shop Problems in Machining Stainless Are Dealt With

Reported by Stephen M. Jablonski
Metallurgist, Wyman-Gordon Co.

A practical talk on "Machining of Stainless Steels", presented before the January meeting of the Worcester Chapter A.S.M., dealt with tooling problems encountered in the shop. George J. Stevens, mechanical engineer, Rustless Division, Armco Steel Corp., was the speaker.

G. J. Stevens

The free-machining A.I.S.I. Types 416 and 303 show considerable advantage in machinability over other types in their respective groups, Mr. Stevens stated. Machining difficulties with the 300 series of stainless steels arise from their softness and propensity to cold working.

No set rules can be applied to tooling, for design is dependent on operation and specific application. Most tool failures on machining stainless steels are due to high tool pressures and temperatures, the speaker pointed out. Heavy cuts and constant feeds are important in improving tool life.

The Chapter observed Past Chairmen's Night on this occasion, honoring former leaders. Howard B. Johnson of the Awards Committee presented certificates of recognition to 13 past chapter chairmen.

Object of Materials Control Defined

Reported by R. F. Harvey
Brown & Sharpe Mfg. Co.

"The object of materials control is to insure that the finished product will possess the required physical properties, and to accomplish this objective with minimum manufacturing costs consistent with the correct functioning of the product," said J. V. Baxter, superintendent of inspection, United Shoe Machinery Corp., addressing the February meeting of the Rhode Island Chapter A.S.M.

The speaker emphasized five functions covered by materials control. Discussing design, he used blackboard illustrations to explain the desirability of avoiding abrupt changes in section and sharp angles. Methods of quenching may also be modified to induce favorable stresses in the right direction and thus increase the strength of tools. Specifications, purchasing, and knowledge of manufacturing methods for materials are important in relation to effective inspection.

Practical inspection methods include hardenability tests, macro-etch, metallographic analysis and hardness tests. The talk was concluded with a practical demonstration of spark testing and a series of slides showing typical plant problems and their correction.

As a special feature a panel of experts answered questions from the floor on all phases of heat treatment, selection of material and fabrication. The panel consisted of R. C. Pranik, Seaboard Screw Co.; W. M. Saunders, Jr., W. M. Saunders Laboratory; G. H. Schwdersky, Bulova Watch Co.; J. E. Carter, Halcomb Works, Crucible Steel Co. of America; L. Lepore, Atlantic Tool Co.; R. H. Mairs, Rhode Island State College; B. A. Hackett, United Wire & Supply Co.; C. B. Rex, U. S. Naval Base.

The panel discussion and the main speaker contributed to a lively meeting, with considerable discussion from the floor. Prior to the main speaker, a brief report on "Cleaning up Narragansett Bay" was presented by Harvey Flint, chairman of the Anti Pollution Committee.

IMPORTANT MEETINGS

For May

May 2-3—Association of Iron and Steel Engineers. Annual Spring Conference, Lord Baltimore Hotel, Baltimore, Md. (T. J. Ess, managing director, A.I.S.I., Empire Bldg., Pittsburgh 22.)

May 2-4—American Society of Mechanical Engineers. 1949 Spring Meeting, New London, Conn. (Ernest Hartford, Executive assistant secretary, A.S.M.E., 29 West 39th St., New York 18.)

May 2-5—American Foundrymen's Society. 1949 Foundry Congress, St. Louis, Mo. (William W. Maloney, secretary-treasurer, A.F.S., 222 West Adams St., Chicago 6.)

May 4-7—Electrochemical Society. Semiannual meeting, Ben Franklin Hotel, Philadelphia. (R. M. Burns, secretary, 235 West 102nd St., New York 25.)

May 5-6—American Society for Quality Control. Third Annual Convention and New England Quality Control Conference, Copley Plaza Hotel, Boston. (Miss Dorothy M. Lewis, 28 Haskell Ave., Revere 51, Mass.)

May 5-7—Acoustical Society of America. 20th Anniversary Meeting, Statler Hotel, New York. (Harold Burris-Meyer, Stevens Institute of Technology, Hoboken, N. J.)

May 10-13—American Management Association. 18th National Packaging Exposition, Public Auditorium, Atlantic City, N. J. (Edward K. Moss, public relations director, A.M.A., 330 West 42nd St., New York City.)

May 12-13—Instrument Society of America. Spring Meeting, Royal York Hotel, Toronto, Canada. (Richard Rimbach, secretary, I.S.A., 1117 Wolfendale St., Pittsburgh 12.)

May 19-21—Society for Experimental Stress Analysis. Spring Meeting, Hotel Statler, Detroit. (W. M. Murray, secretary, S.E.S.A., P. O. Box 168, Cambridge 39, Mass.)

May 21—Society for Applied Spectroscopy. Symposium on Theory and Application of Spectroscopy, Brooklyn Polytechnic Institute, Brooklyn, N. Y. (Henry H. Hausner, Nichols Bldg., Room 108, New York University, University Heights, New York 53.)

May 25-26—American Iron and Steel Institute. 57th General Meeting, Waldorf-Astoria Hotel, New York. (George S. Rose, secretary, A.I.S.I., 350 Fifth Ave., New York 1, N. Y.)

May 30-June 1—Metal Treating Institute. Spring Meeting, Chateau Frontenac, Quebec, Canada. (Stewart N. Clarkson, executive secretary, M.T.I., 420 Lexington Ave., New York 17.)

Relates Impressions of Trips Abroad

At a Joint Meeting of the Local A. S. M. Chapter With the Superintendents and Production Managers Group of the Industrial Management Council of Rochester Are (Left to Right): Walter E. Wood, Vice-President of the Superintendents Group; Guido P. Palma, A. S. M. Chairman; Thomas L. Lee, General Manager, Rochester Products Division, G.M.C.; and Bayard D. Kunkle, G. M. Vice-President in Charge of Overseas Division, the Main Speaker

Reported by J. J. Buczynski
Taylor Instrument Companies

The Rochester Chamber of Commerce was the site of an address on Feb. 21 by Bayard D. Kunkle, vice-president of General Motors Corp. in charge of Overseas Division. In attendance were some 200 members and guests of both the Rochester Chapter A.S.M. and the Superintendent and Production Managers' Group of the Industrial Management Council of Rochester.

Mr. Kunkle summarized his impressions gathered during recent trips abroad and presented details of economic and industrial conditions in England, France, Belgium, Germany, New Zealand and Australia.

The only hope of recovery for some nations is through outright help of the United States, according to Mr. Kunkle. A few nations are in a position to better their economy by establishing a favorable balance between their exports and imports.

Dayton Chapter Guests of Frigidaire

Reported by O. G. Saunders
Chief Metallurgist, Hobart Mfg. Co.

Aside from being informative, it is always enjoyable to get out and see how the other fellow does things. As guests of the Frigidaire Division of G.M.C., the members of the Dayton Chapter A.S.M. and their ladies were given a dinner on Feb. 2. The ladies were then entertained by the Frigidaire Home Economics Group, who gave demonstrations of various household appliances.

Meanwhile F. H. McCormick, assistant chief engineer for Frigidaire, spoke to the members on "Development of the Automatic Clothes Washer". The successful development of such an appliance, he pointed out, depends on the teamwork of the various departments. The designing engineers, draftsmen, stylists, patent counsel, metallurgists, testing laboratories, market research groups, process planning and purchasing departments all must work together in order to produce a good, salable product.

Among the interesting mechanical features of the clothes washer, Mr. McCormick explained the function of the flywheel suspended by radial leaf springs from the driving shaft immediately below the tub. This permits greater rotating speeds without objectionable vibration. In spinning the tub with an unequal distribution of load, the suspension of the flywheel permits it to shift in such a manner that the out-of-balance condition is minimized. The energy of the couple thus produced is largely absorbed by a friction snubber plate at the bottom of the washer.

After the lecture the A.S.M. members rejoined the ladies for a plant inspection tour. This plant employs approximately 21,000 men and women, and its production and assembly lines are served with over 22 miles of conveyers.

Titanium Metal Produced by Arc Melting; Strength, Corrosion Compared to 18-8

Reported by Morris Cohen
Massachusetts Institute of Technology

A graphic picture of the metallurgy of titanium and titanium-base alloys was presented to over 200 members and guests of the Boston Chapter when Howard C. Cross of Battelle Memorial Institute addressed the January meeting.

Several methods of producing metallic titanium pure enough to be ductile at room temperature are available. The De Boer process produces the highest purity titanium by decomposition of titanium iodide on a hot filament, while the Kroll process involves the reduction of titanium tetrachloride by an active metal such as magnesium. The latter procedure is considered to be the most practical for large-scale operations at the present time.

Ductile titanium metal has been produced by the Bureau of Mines and others using powder metallurgy techniques. The metal can be strengthened appreciably by cold working.

A special arc-melting furnace has been developed at Battelle for direct melting of titanium powder or sponge using a water-jacketed copper crucible, a tungsten-tipped water-cooled electrode, and a pure argon atmosphere. Arc-melted and hot-forged titanium exhibits slightly higher strength values than powder-metallurgy titanium. DuPont and Remington Arms' titanium containing small amounts of carbon from the melting operation shows similar tensile properties.

Iodide titanium, which is of very high purity and only 40,000 p.s.i. in tensile strength, is an admirable base-material for alloy studies. In experiments on gaseous additions, Mr. Cross reported that nitrogen increases the tensile strength of iodide titanium threefold, while with oxygen the increase is two-fold. Hydrogen has very little effect. In arc-melted titanium, carbon in limited amounts is apparently not detrimental to the ductility and may be a desirable addition. Titanium alloys produced by both powder-metallurgy and arc-melting techniques can be strengthened significantly with chromium, molybdenum, and tungsten.

On a strength basis unalloyed titanium is superior to magnesium and aluminum alloys, S.A.E. 1015 steel, and annealed 18-8 Cr-Ni steel. Only fully heat treated alloy steels and cold-worked 18-8 display greater strengths. Hot worked and annealed titanium is considerably superior to annealed 18-8 steel on a strength-weight basis. The strength of titanium at 800° F. is roughly comparable to that of aluminum alloys at 400° F.

Howard C. Cross Displays a Small Ingot of Titanium Metal to Illustrate His Talk Before the Boston Chapter (Photo by H. L. Phillips)

Corrosion tests indicate that titanium is at least equivalent to 18-8 for general marine applications.

Unalloyed titanium, prepared by arc melting, can be forged or rolled without difficulty at temperatures ranging from 1450 to 1950° F. It appears to be more difficult to machine than aluminum and copper-base alloys, plain carbon steels of similar strength, and 18-8, but easier than the Hadfield-type manganese steels. In preliminary tests titanium has shown good welding characteristics.

Clarkson College Holds Round Table Series

A series of round table discussions on practical metallurgy has been inaugurated at Clarkson College of Technology, Potsdam, N. Y. Francis W. Brown, assistant professor of chemistry at Clarkson, is acting as moderator of the series, which he developed in an attempt to arouse enough interest in metals and alloys so that an A.S.M. chapter can be formed in that region.

The first meeting was held on March 10, with W. C. King, chief plant metallurgist at the Aluminum Co. of America, as guest speaker. Mr. King's subject was "The Ingot Casting of Aluminum".

Future speakers include R. A. Wilkins, director and vice-president of Revere Copper and Brass, Inc., Rome, N. Y.; Gordon Mutch, metallurgical research engineer of Revere; and G. W. Pirk of Rome Cable Corp.

Radioactive Tracers Applied to Studies Of Diffusion Rates

Reported by Howard J. Godfrey
John A. Roebling's Sons Co.

Philadelphia Chapter, A.S.M., was initiated to its first formal discourse on the use of "Radioactive Tracer Techniques in the Solution of Metallurgical Problems" by C. E. Birchenall of the Metals Research Laboratory, Carnegie Institute of Technology, at its February meeting.

Dr. Birchenall described a radioactive tracer as an atom with an unstable nucleus which decomposes with time by giving off radiations, which may be of several types.

The speaker explained carefully how isotopes can be obtained by applying to the Atomic Energy Commission. Not all isotopes, however, are readily available, since only a limited number can be made in an atomic pile with neutron bombardment. Many isotopes have to be made in the cyclotron by bombardment with deuterons, protons, alpha, beta and gamma particles; for this reason a very limited supply of these radioactive tracers is available.

Atomic tracers are being used in pure, applied, and industrial research. Among examples of each Dr. Birchenall described a study of the speed of diffusion of solid solutions. The rate of diffusion as found by the atomic tracer method checked very closely with that obtained by chemical methods. Tracers have also been used for studies on iron self-diffusion, transfer of iron across slag-metal interfaces, and desulphurization of coal during coking.

Atomic tracers have been used to study friction, particularly the decomposition of lubricants, and wear on pistons. The disposition of welding rods and coating material might be investigated in welded areas with the use of isotopes.

Industrial applications include the use of radioactive cobalt in place of radium for radiography. The half life of cobalt-60 is five years, and it is readily available. Another application is in a liquid level gage for determining the height of molten metal inside a closed unit.

Among the more useful nonmetallic isotopes are phosphorus and sulphur, Dr. Birchenall stated. Of the metals, iron and cobalt isotopes are good. Manganese is good except that the isotopes have to be made in the cyclotron. The isotopes of nickel, aluminum, magnesium and silicon are not very satisfactory.

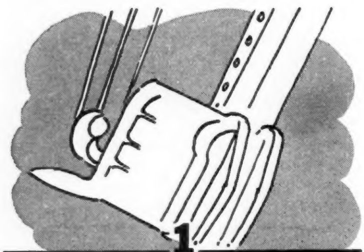
Prior to the technical lecture, Chapter Chairman William J. De Mauriac presented 48 Silver Certificates to 25-year members of the Philadelphia Chapter.

A. S. M. Review of Current Metal Literature

An Annotated Survey of Engineering, Scientific and Industrial Journals and Books Here and Abroad, Received During the Past Month

Prepared in the Library of Battelle Memorial Institute, Columbus, Ohio

Ralph H. Hopp, Librarian *W. W. Howell, Technical Abstractor*



1 ORE BENEFICIATION and RESERVES

1A—General

1A-12. The Replenishment of Our Mineral Reserves. James Boyd. *Journal of American Zinc Institute,* v. 26, 1948, p. 43-51; discussion, p. 51-54.

Need for replenishment and recommendations.

1A-13. Laboratory Ore Testing Procedure. Clarence Thom and Frank A. Seeton. *Deco Trefoil,* v. 13, Jan.-Feb. 1949, p. 5-8.

Procedures and techniques to aid laboratory technicians in commercial, academic, and private ore-dressing laboratories.

1A-14. Minerals Beneficiation. J. F. Myers, E. H. Crabtree, and S. R. Zimmerly. *Journal of Metals; Mining Engineering; Journal of Petroleum Technology,* v. 1, sec. 2, Mar. 1949, p. 66-71.

Annual review.

1A-15. Is Screening to Third Dimension Fully Developed? Owen H. Perry. *Mining Engineering,* v. 1, sec. 1, Mar. 1949, p. 17-19; discussion, p. 19, 24, 26.

In separating sapphire crystals for use as jewel bearings, the usual screening operation did not separate crystals which were too thin, although they were of proper diameter. Unique device designed to separate mechanically the desired thicknesses.

1A-16. Thickening—Art or Science? E. J. Roberts. *Mining Engineering,* v. 1, sec. 3, Mar. 1949, p. 61-64.

Theory and practice. Mathematics of the "teeter" zone and of the compression zone in thickeners and classifiers.

1A-17. Crushing Strengths of Minerals at Low Temperatures. James M. Weigle. *Science,* v. 109, Mar. 4, 1949, p. 229-230.

Effects of subnormal temperatures on the crushing strengths of several available common minerals. The changes from 25 to −183° C. were as follows: serpentine, +517%; prochlorite, +227%; selenite, +129%; graphite, +104%; and halite, −72%.

1B—Ferrous

1B-16. Investigation of the Sheep Creek Iron Deposits, Meagher County, Mont. Glenn C. Reed. *U. S. Bureau of Mines,* Report of Investigations 4400, Jan. 1949, 9 pages.

Results of beneficiation tests on a composite sample which included log washing, sink-float, jigging, and tabling. Hydrogen reduction tests followed by Davis-tube wet magnetic analyses also were made.

1B-17. B. C. Steel. F. H. Fullerton. *Canadian Metals and Metallurgical Industries,* v. 12, Feb. 1949, p. 25, 30.

Iron-ore deposits in British Columbia.

1B-18. The Steel Industry in Transition. *Metal Progress.* E. E. Thum. v. 55, Feb. 1949, p. 155-157.

The rapidly approaching exhaustion of open-pit mines on the Mesabi range leads to a consideration of future sources of iron ore. A period of rapid development of ore concentrators predicted, even though this may be a temporary expedient while the steel industry is relocated so as to use, economically, new sources of ore.

1B-19. Iron Ore. M. D. Harbaugh. *Mining Congress Journal,* v. 35, Feb. 1949, p. 76-80.

See item 1B-15, 1949.

1B-20. Republic Steel Buys Into Liberia Mining Co. on Iron Ore Deal. Bill Lloyd. *Iron Age,* v. 163, Mar. 17, 1949, p. 141.

High-grade African deposit and financial and transportation arrangements for its utilization.

1C—Nonferrous

1C-15. Investigation of Valzinco Lead-Zinc Mine, Spotsylvania County, Va. Wesley A. Grosh. *U. S. Bureau of Mines,* Report of Investigations 4403, Jan. 1949, 7 pages.

Milling and concentration flowsheet.

1C-16. Application of Ion Exchange Resins in the Cyanidation of a Gold and Silver Ore. S. J. Hussey. *U. S. Bureau of Mines,* Report of Investigations 4374, May 11, 1948, 34 pages.

Recovery of Au and Ag from a clayey, slimy ore.

1C-17. Concentration of Oxide Manganese Ores From Northeastern Utah, Daggett Chief and Gray Hawk Properties. R. Havens and J. A. McAllister. *U. S. Bureau of Mines,* Report of Investigations 4389, Jan. 1949, 14 pages.

Investigations on two manganese deposits for domestic use. Results for three different ores.

1C-18. Investigation of the Electric Point and Gladstone Lead-Zinc Mines, Stevens County, Wash. John W. Cole. *U. S. Bureau of Mines,* Report of Investigations 4392, Jan. 1949, 11 pages.

Includes results of mineral dressing tests.

1C-19. Sampling of Helen Beryl Pegmatite, Custer County, S. Dak. John Paul Gries. *U. S. Bureau of Mines,* Report of Investigations 4396, Jan. 1949, 14 pages.

Includes results of beneficiation tests.

1C-20. Copper Industry. J. G. Leckie. *Journal of Metals; Mining Engineering; Journal of Petroleum Technology,* v. 1, sec. 2, Mar. 1949, p. 76-77.

New production and technological developments.

1C-21. The Recovery of Cadmium From Cadmium-Copper Precipitate, Electrolytic Zinc Co. of Australasia, Risdon, Tasmania. G. H. Anderson. *Journal of Metals,* v. 1, sec. 3, Mar. 1949, p. 205-210.

Oxidation and grinding of the Cd-Cu precipitate; leaching and filtering; precipitation of Cd; oxidation and grinding of the precipitated Cd; leaching oxidized Cd precipitate and purification of leach solution; electrolysis; and melting, casting, and packing. Includes flow diagrams.

1C-22. Atomic Energy Minerals. *Mining Congress Journal,* v. 35, Feb. 1949, p. 48-52.

Recent developments and trends.

1C-23. Mineral Dressing in 1948. A. W. Schlechten and T. M. Morris. *Mining Congress Journal,* v. 35, Feb. 1949, p. 81-83.

New developments.

1C-24. A Rapid Determination for Calcium. J. E. Williamson. *Engineering and Mining Journal,* v. 150, Mar. 1949, p. 75.

Technique used in control of alkalinity of cyanidation solutions.

1C-25. Minerals for Chemical and Allied Industries. A Review of Sources, Uses and Specifications. Part XXIX. J. Johnstone. *Industrial Chemist and Chemical Manufacturer,* v. 25, Feb. 1949, p. 117-123.

Vanadium and compounds. (To be continued.)

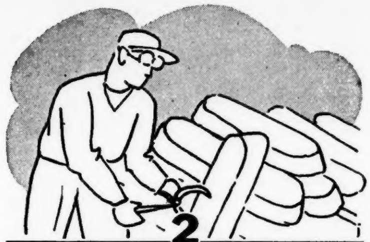
1D—Light Metals

1D-2. Investigation of Black Mountain Beryl Deposit, Oxford County, Maine. E. E. Maillot, Margaret F. Boos, and McHenry Mosier. *U. S. Bureau of Mines,* Report of Investigations No. 4412, Feb. 1949, 10 pages.

Includes a brief summary of results of metallurgical testing. No method of flotation was found that was successful in separating the beryl and spodumene; but by employing heavy-medium separation to remove spodumene, 75.4% of the BeO was recovered in a flotation concentrate assaying 10.4% Be.

For additional annotations indexed in other sections, see:

2C-11; 2D-7; 17-19



SMELTING, REDUCTION and REFINING

2B—Ferrous

2B-34. Use of Oxygen (or Compressed Air) in the Open Hearth Furnace. Frank G. Norris. *Industrial Heating,* v. 16, Feb. 1949, p. 272, 274, 276. A condensation.

Carbon elimination in the open-hearth, the rate of injection, rate of carbon elimination, time restrictions, bottom delay, heat time and quality considerations; use of oxygen or compressed air for flame enrichment; and use of hot metal for desiliconization.

2B-35. Jet Caster Technique Speeds Tapping of Blast Furnaces and Open Hearths. *Steel,* v. 124, Feb. 21, 1949, p. 108, 110-111, 114, 130.

See abstract from *Iron Age,* item 2B-28, 1949. This article also summarizes several other papers presented at the winter meeting of the Eastern States Blast Furnace and Coke Oven Association. Subjects covered are: hard-fired blast-furnace linings; use of carbon linings in blast furnaces; chemical cleaning of gas-cleaning equipment; and blending of coal to improve coke quality.

2B-36. Coke Ash and Coke Sulfur in the Blast Furnace. H. H. Lowry. *Industrial and Engineering Chemistry,* v. 41, Mar. 1949, p. 502-510.

An evaluation, in part qualitative and in part quantitative, of the importance of the coke ash and sulfur on the operation of a furnace and on the quality of the iron produced. Inadequate control of other operating variables is believed to be often responsible for disproportionate blame for poor furnace performance being assigned to coke quality. 70 ref.

2B-37. Production of Tool Steel. George A. Roberts and Charles F. Sawyer. *Steel,* v. 124, Feb. 28, 1949, p. 102, 105-106, 108, 111; Mar. 7, 1949, p. 118, 120, 123-124.

Equipment and procedures. First installment: melting, refining, and ingot casting. Concluding installment: soaking pit practice; billet forging; billet rolling; annealing of billets and bars; procedures for inspection of intermediate and finished products; and miscellaneous procedures.

2B-38. Iron and Steel Producers. Walter Carroll. *Journal of Metals; Mining Engineering; Journal of Petroleum Technology,* v. 1, sec. 2, Mar. 1949, p. 107-111.

1948 developments in commerce and technology of steelmaking.

2B-39. Canadian Steel; Open-Hearth Practice at Algoma. Norman F. Dufty. *Iron and Steel,* v. 22, Feb. 1949, p. 45-48.

Raw-materials and fuel used; furnaces, refractories, and auxiliary equipment; general procedures.

2B-40. Basic O.H. Ingots; A Statistical Investigation of Cracking. I. M. Mackenzie and A. J. Donald. *Iron and Steel,* v. 22, Feb. 1949, p. 59-61.

The method of multiple graphical correlation. Statistical analysis shows that furnace practice has a considerable influence on the cracking of ingots of basic openhearth steel. (See also item 2b-205, 1948.)

2B-41. Steelmaking in a British Foundry. Norman F. Dufty. *Foundry,* v. 77, Mar. 1949, p. 82-83, 248-250, 252.

Practice with the acid-lined electric-arc furnace.

2B-42. An Evaluation of Steel Cleanliness. Philip Schane, Jr. *Proceedings of the Electric Furnace Steel Conference, American Institute of Mining and Metallurgical Engineers,* v. 5, 1947, p. 3-7; discussion, p. 7-13.

Previously abstracted from condensed version in *Blast Furnace and Steel Plant.* See item 2b-30, 1948.

2B-43. Deoxidation and Deoxidation Products in Electric-Furnace Steel. Sidney W. Poole. *Proceedings of the Electric Furnace Steel Conference, American Institute of Mining and Metallurgical Engineers,* v. 5, 1947, p. 13-18; discussion, p. 18-22.

Effects of various deoxidation practices on quality. Determination of inclusions formed in large heats by metallographic and other means. Factors involved in elimination of inclusions. 10 ref.

2B-44. Problems Associated With the Production of Sound Ingots. R. L. Stephenson. *Proceedings of the Electric Furnace Steel Conference, American Institute of Mining and Metallurgical Engineers,* v. 5, 1947, p. 32-41; discussion, p. 41-42.

See abstract from *Western Machinery and Steel World,* item 2b-41, 1948.

2B-45. Large Ingots. Francis B. Foley. *Proceedings of the Electric Furnace Steel Conference, American Institute of Mining and Metallurgical Engineers,* v. 5, 1947, p. 43-45; discussion, p. 45-49.

See abstract from *Industrial Heating,* item 2b-166, 1948.

2B-46. Production of Sound Billet-Type Ingots. B. C. Blake. *Proceedings of the Electric Furnace Steel Conference, American Institute of Mining and Metallurgical Engineers,* v. 5, 1947, p. 49-51; discussion, p. 51.

Ladle technique, pouring small ingots, and stripping and yields of the above.

2B-47. The Dornin Process. George A. Dornin, Jr. *Proceedings of the Electric Furnace Steel Conference, American Institute of Mining and Metallurgical Engineers,* v. 5, 1947, p. 52-57; discussion, p. 57-58.

Method of producing sound steel without hot tops which was successfully used in the production of 17,000 tons of electric furnace steel during a three-year development period.

2B-48. Estimating Costs of Industrial Oxygen. Martin J. Conway and James J. Hogan. *Proceedings of the Electric Furnace Steel Conference, American Institute of Mining and Metallurgical Engineers,* v. 5, 1947, p. 67-73; discussion, p. 73-78.

Advantages of using pure oxygen in the production of steel. Low-pressure continuous process for producing oxygen and calculation of unit cost. Schematic flow sheet.

2B-49. Effect of Mold Thickness and Cooling on Base Quality of Intermediate Size Ingots. George Breyer. *Proceedings of the Electric Furnace Steel Conference, American Institute of Mining and Metallurgical Engineers,* v. 5, 1947, p. 59-63; discussion, p. 64-66.

Effect of teeming temperatures and mold thickness on nature, occurrence, and distribution of inclusions and surface defects.

2B-50. Present Applications of Oxygen in Electric-Furnace Steelmaking. J. H. Berryman. *Proceedings of the Electric Furnace Steel Conference, American Institute of Mining and Metallurgical Engineers,* v. 5, 1947, p. 78-81; discussion, p. 89-93.

Use of oxygen in melting scrap, in controlling bath temperature, and in accelerating decarburization.

2B-51. Some Aspects of the Use of Oxygen in the Electric Furnace. J. M. Gaines and G. M. Skinner. *Proceedings of the Electric Furnace Steel Conference, American Institute of Mining and Metallurgical Engineers,* v. 5, 1947, p. 82-88; discussion, p. 89-93.

Recent information from a practical viewpoint.

2B-52. A Quantitative Experimental Investigation of the Hydrogen and Nitrogen Contents of Steel During Commercial Melting. Clarence E. Sims, George A. Moore, and Donald W. Williams. *Proceedings of the Electric Furnace Steel Conference, American Institute of Mining and Metallurgical Engineers,* v. 5, 1947, p. 106-124; discussion, p. 124-130.

Previously abstracted from *Metals Technology.* See item 2b-33, 1948.

2B-53. A Rational Process for the Improved Manufacture of Steel Without Inclusions. Georges Ranque. *Proceedings of the Electric Furnace Steel Conference, American Institute of Mining and Metallurgical Engineers,* v. 5, 1947, p. 130-147; discussion, p. 147-150.

Conditions of formation and stability of inclusions and an operative process attempting to eliminate or minimize them. Laws of physical chemistry and physics that apply to liquid slag-metal systems.

2B-54. Recovery of Vanadium and Other Alloys in the Acid Electric Furnace. Clyde Wyman and George W. Johnson. *Proceedings of the Electric Furnace Steel Conference, American Institute of Mining and Metallurgical Engineers,* v. 5, 1947, p. 203-223; discussion, p. 223-227.

Efficiency of alloy recovery from residuals contained in the bath. A series of 24 heats was produced and studied at the Burnside Steel Foundry Co.

2B-55. Review of Known Factors Controlling Slag Volume. Charles Locke. *Proceedings of the Electric Furnace Steel Conference, American Institute of Mining and Metallurgical Engineers,* v. 5, 1947, p. 228-234; discussion, p. 256-260.

13 ref.

2B-56. Effect of Bottom Shape and Life on Slag Volume in Acid Electric Furnace. J. A. Bowers. *Proceedings of the Electric Furnace Steel Conference, American Institute of Mining and Metallurgical Engineers,* v. 5, 1947, p. 235-238; discussion, p. 256-260.

Investigation carried out in two 1000 lb. per hr. Lectromelt top-charge furnaces.

2B-57. Effect of Extent of Bottom Repairs on Slag Volume in Acid Electric Furnace. J. D. Cannon. *Proceedings of the Electric Furnace Steel Conference, American Institute of Mining and Metallurgical Engineers,* v. 5, 1947, p. 238-240; discussion, p. 256-260.

Slags from 0.25 to 0.35% plain carbon steels melted in a 3-ton, acid-lined Lectromelt furnace with a 2500-kva. transformer.

2B-58. Effect of Bank Repairs on Slag Volume in Acid Electric Steelmaking. F. B. Eiseman. *Proceedings of the Electric Furnace Steel Conference, American Institute of Mining and Metallurgical Engineers,* v. 5, 1947, p. 241; discussion, p. 256-260.

It is concluded that no basis for comparison of the above is feasible.

2B-59. Effect of Cleaned vs. Uncleaned Foundry Scrap on Slag Volume. W. L. Doyle. *Proceedings of the Electric Furnace Steel Conference, American Institute of Mining and Metallurgical Engineers,* v. 5, 1947, p. 243; discussion, p. 256-260.

Four slag weights were studied.

2B-60. Effect of Metal Depth on Slag Volume in Electric Furnace. M. T. McDonough. *Proceedings of the Electric Furnace Steel Conference, American Institute of Mining and Metallurgical Engineers,* v. 5, 1947, p. 245; discussion, p. 256-260.

Experimental data.

2B-61. Effect of Temperature and of Basic Additions on Slag Volume in the Electric Furnace. J. B. Caine and G. R. McDaniels. *Proceedings of the Electric Furnace Steel Conference, American Institute of Mining and Metallurgical Engineers,* v. 5, 1947, p. 248-250; discussion, p. 256-260.

Investigation at Sawbrook Steel Castings Co.

2B-62. Effect of Iron-Ore Additions on Slag Volume in the Electric Furnace. H. R. Hoffman. *Proceedings of the Electric Furnace Steel Conference, American Institute of Mining and Metallurgical Engineers,* v. 5, 1947, p. 250-254; discussion, p. 256-260.

Experimental conditions.

2B-63. Effect of Manganese Ore on Slag Volume. C. C. Spencer. *Proceedings of the Electric Furnace Steel Conference, American Institute of Mining and Metallurgical Engineers,* v. 5, 1947, p. 254-255; discussion, p. 256-260.

Results of investigation.

2B-64. Effect of Time of Heat on Slag Weight in the Electric Furnace. R. H. Frank. *Proceedings of the Electric Furnace Steel Conference, American Institute of Mining and Metallurgical Engineers,* v. 5, 1947, p. 255-256; discussion, p. 256-260.

Data tabulated from normal operation at the Bonney-Floyd Co.

2B-65. Melting of Quality Basic Electric Steel. T. V. Simpkinson. *Blast Furnace and Steel Plant,* v. 37, Feb. 1949, p. 212-216. A condensation.

The process of melting fully killed steel wherein, after suitable oxidation, the bath is de-oxidized under a reducing slag. Melting of cold scrap charges. (To be continued.)

2B-66. Gaseous Reduction Methods for the Production of Sponge Iron. Edward P. Barrett. *U. S. Bureau of Mines,* Report of Investigations No. 4402, Feb. 1949, 45 pages.

Methods proposed or tried during the past 100 years. 194 ref.

2B-67. Die Manganausnutzung beim basischen Siemens-Martin-Verfahren. (The Utilization of Manganese in the Basic Openhearth Furnace.) Walter Krauskopf. *Stahl und Eisen,* v. 68, Mar. 25, 1948, p. 123-124.

A critical discussion of recent articles by H. J. Krabiell and C. Schwarz.

2B-68. Physikalisch-chemische Grundlagen der Verfahren der Eisen- und Stahlerzeugung. (The Physicochemical Principles of Iron and Steel Production.) Willy Oelsen. *Stahl und Eisen,* v. 68, May 20, 1948, p. 175-186.

Published and unpublished literature dealing with research on the metallurgy of iron done in Germany during 1947. 85 ref.

2B-69. Die Hutte Braunschweig der Reichswerke AG. und ihre Betriebsergebnisse in den Jahren 1942 bis 1944. Ein Beitrag zur Nutzbarmachung der Salzgitter-Erze. (The Braunschweig Works of Reichswerke A.G. and Results of Operation During 1942-1944. Concerning Utilization of the Salzgitter Ores.) Konrad Hofmann and Eugen Peetz. *Stahl und Eisen,* v. 68, June 17, 1948, p. 213-228; July 15, 1948, p. 255-268.

Includes maps, diagrams, tables, charts, and a graph showing the complete layout. The low-Fe high-Si ores mined in the Salzgitter area were successfully converted into steel by the acid melting process in different types of converters. 21 ref.

2B-70. Die Erzeugung der Ferrolegierungen in Deutschland während der Jahre 1939 bis 1946. (The Production of Ferrous Alloys in Germany During the Years 1939-1946.) Georg Volkert. *Stahl und Eisen,* v. 68, July 15, 1948, p. 268-271.

Methods of producing ferrochromium, manganese alloys, ferromolybdenum, ferrosilicon, ferrotitanium, ferrovanadium, ferrotungsten, and ferrozirconium-silicon. A diagram shows the electro-silico-thermal process of producing high-carbon ferroalloys. 17 ref.

2B-71. Die Oxydfilmtheorie als Grundlage fur die Herstellung von hochwertigem Thomasstahl. (The Oxide-Film Theory as a Basis for Production of High-Test Basic Bessemer Steel.) Gerhard Naeser. *Stahl und Eisen,* v. 68, Oct. 7, 1948, p. 375-378.

According to the above theory, a film of iron oxide slag between the molten metal and the "incoming" blast prevents the steel from absorbing nitrogen. A method of producing high-test low-nitrogen steels in the basic bessemer converter.

2B-72. Ueber den Stickstoffgehalt von Roheisen. (Concerning the Nitrogen Content of Pig Iron.) Theo. Kootz and Werner Holtmann. *Stahl und Eisen,* v. 68, Oct. 7, 1948, p. 378-383.

The various factors that determine it directly or indirectly. 42 ref.

2B-73. Stickstoffgehalt von Thomasstahl und Roheisen. (Nitrogen Content of Basic Bessemer Steel and Pig Iron.) Erwin Eickworth. *Stahl und Eisen,* v. 68, Oct. 7, 1948, p. 383-387.

The nitrogen content increases with the rate of smelting and melting. Experiments show that a slow rate of melting increases the phosphorus content, reducing the "phosphorus period," thus preventing absorption of nitrogen. The P and Si content did not appear to affect the N content of the finished steel.

2B-74. Beeinflussung des Stickstoffgehaltes von Kleinkonverterstahl durch verschiedenartiges Blasen. (Effect of Different Types of Blast on the Nitrogen Content of Steel Made in a Small Converter.) Herbert Jurich and Walter Eilender. *Stahl und Eisen,* v. 68, Oct. 7, 1948, p. 387-395.

The nitrogen content is reduced when the blast passes through the melt at an angle of 10 to 15° to the base of the converter. The increased liquidity of the slag produced no advantages; the addition of ferrosilicon did not increase the N content; and the latter was wholly independent of temperature. 10 ref.

2B-75. Practices Affecting Yields and Surface Quality of Rimmed and Semikilled Steel. Leo R. Silliman. *Proceedings of the National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 31, 1948, p. 14-26.

Previously abstracted from *Blast Furnace and Steel Plant.* See item 2b-124, 1948.

2B-76. Use of Oxygen in Hot Metal for Agitation of the Bath. Henry E. Warren, Jr. *Proceedings of the National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 31, 1948, p. 27-33; discussion, p. 33-35.

Experiments with oxygen-nitrogen mixtures.

2B-77. Use of Oxygen (or Compressed Air) in the Open-Hearth Furnace. Frank G. Norris. *Proceedings of the National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 31, 1948, p. 35-41; discussion, p. 41-42.

Previously abstracted from *Industrial Heating.* See item 2B-34, 1949.

2B-78. Operation of Oxygen-Enriched Open-Hearth Furnaces. J. S. Marsh. *Proceedings of the National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 31, 1948, p. 43-54; discussion, p. 54-56.

Previously abstracted from *Metals Technology.* See item 2b-167, 1948.

2B-79. Use of Multiple Burners and Compressed Air to Improve Operating Rates of Open-Hearth Furnaces. Umbert F. Corsini. *Proceedings of the National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 31, 1948, p. 70-73; discussion, p. 73-74.

Previously abstracted from condensation in *Industrial Heating.* See item 2b-143, 1948.

2B-80. Factors Affecting Basic Open-Hearth Operating Rates. Oscar Pearson. *Proceedings of the National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 31, 1948, p. 74-84; discussion p. 84-87. Based on paper by R. H. Ede and J. H. Hoffman.

Work done at the Gary Works metallurgical dept.

2B-81. Oxygen Through the Burner at Granite City Steel Company's Plant. R. C. Solomon. *Proceedings of the National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 31, 1948, p. 88-90; discussion, p. 95-96.

Tabulates results.

2B-82. Metallurgical Oxygen in Cold-Metal Shops. L. L. Whitney. *Proceedings of the National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 31, 1948, p. 91-95; discussion, p. 95-96.

Melting by directing oxygen onto preheated scrap.

2B-83. Use of Oxygen for Carbon Reduction With Cold-Metal Practice. H. M. Parker. *Proceedings of the National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 31, 1948, p. 96-97; discussion, p. 97.

Practice at Armco Steel Corp., Butler, Pa.

2B-84. Use of Compressed Air at Scullin Steel Company. D. J. Murphy. *Proceedings of the National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 31, 1948, p. 98; discussion, p. 98.

Use in openhearth practice for carbon reduction during refining.

2B-85. Compressed Air Used at Granite City. F. von Gruenigen. *Proceedings of the National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 31, 1948, p. 98-100.

Use of compressed air in openhearth practice at American Steel Foundries for the purpose of reducing carbon during the refining period.

2B-86. Use of Compressed Air for Carbon Reduction at Colorado Fuel and Iron Company. W. H. Carpenter. *Proceedings of the National Open Hearth*

Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers, v. 31, 1948, p. 100-101.

2B-87. Methods for Improving Furnace Charging. R. R. Fayles. *Proceedings of the National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 31, 1948, p. 102-109; discussion, p. 109-113.

Preparation of scrap and charging procedure.

2B-88. Sulphur Elimination in Cold-Metal Basic Open-Hearth Practice. Charles W. Briggs. *Proceedings of the National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 31, 1948, p. 114-120.

Data contributed by 14 plants.

2B-89. Production of Low-Sulphur Steel to Minimize Hot Tears. G. L. McMillin. *Proceedings of the National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 31, 1948, p. 120-125; discussion, p. 125.

Hot tears, relation of sulfur to them, and elimination of sulfur.

2B-90. Sulphur Elimination in Casting Steel. Clyde B. Jenni. *Proceedings of the National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 31, 1948, p. 125-126.

Effect of sulfur on properties; sulfur control.

2B-91. Sulphur Removal in the Basic Open-Hearth Furnace. John A. Warchol. *Proceedings of the National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 31, 1948, p. 127-132; discussion, p. 132-134.

Metallurgical factors and furnace conditions that affect the sulfur-removal rate under actual furnace-operating conditions.

2B-92. Surface and Yield of Fully Aluminum-Killed Deep-Drawing Steels. C. W. Conn. *Proceedings of the National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 31, 1948, p. 181-183; discussion, p. 183.

Location of surface defects, interior defects, aluminum additions, and uniformity of aluminum distribution through ingot and heat.

2B-93. Fully Aluminum-Killed, Deep-Drawing Steels. William E. Bayers, Jr. *Proceedings of the National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 31, 1948, p. 184-187; discussion, p. 187.

Effect of deoxidation practice on aluminum variation and causes of surface defects.

2B-94. Defects in Fully Aluminum-Killed Deep-Drawing Steel. G. L. Plimpton. *Proceedings of the National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 31, 1948, p. 187-188; discussion, p. 188-189.

Checking, slabs, and cracking and methods for their control.

2B-95. Basic Open-Hearth Slags—Mineralogy and Control. K. L. Fetters. *Proceedings of the National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 31, 1948, p. 190-202; discussion, p. 208-209.

Open-hearth problems and mineralogy and petrography of slags.

2B-96. Sequence of Slag-Forming Minerals in a Heat. J. S. Griffith. *Proceedings of the National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 31, 1948, p. 202-205; discussion, p. 208-209.

Presents two diagrams showing the sequence in which slag-forming minerals occur during a heat and correlates sequence with familiar slag changes.

2B-97. Slag Control—Where Do We Go From Here? W. O. Philbrook. *Proceedings of the National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 31, 1948, p. 205-208; discussion, p. 208-209.

Present status of development; suggests future research program.

2B-98. Some Observations Regarding Desulphurization in the Basic Open-Hearth Furnace. Michael Tenenbaum. *Proceedings of the National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 31, 1948, p. 210-218; discussion, p. 218-225.

Reviews and emphasizes important features.

2B-99. The Use of Blown Metal in Open-Hearth Steelmaking. H. B. Emerick. *Proceedings of the National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 31, 1948, p. 225-227; discussion, p. 227-230.

Previously abstracted from *Blast Furnace and Steel Plant.* See item 2b-125, 1948.

2B-100. Problems From Sulphur in the Open Hearth. L. R. Berner. *Proceedings of the National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 31, 1948, p. 232-234; discussion, p. 234-235.

Sulfur from fuel; effect of high-sulfur oil; effects of sulfur in scrap.

2B-101. Effect of Raw Materials Available Now and in the Future on Control of Sulphur in the Open Hearth. Henry E. Warren, Jr. *Proceedings of the National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 31, 1948, p. 236-238; discussion, p. 239-244.

Sources of sulfur; six points for consideration in attaining minimum sulfur.

2B-102. Effect of Manganese Sulphide Alloy on Surface Quality of Billets. L. R. Silliman. *Proceedings of the National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 31, 1948, p. 245-248; discussion, p. 248-249.

Compares the above with resulfurization with stick sulfur. Experimental procedure and conditions.

2B-103. Some Conceptions Regarding the Physical-Chemical Mechanisms of the Acid Open-Hearth Process. Clifford E. Wenninger. *Proceedings of the National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 31, 1948, p. 279-293; discussion, p. 293-298.

Relationships depicting mechanisms underlying the divergence in the extremes of the above practice, thus showing how a surplus of either free SiO_2 or free FeO can be concentrated in the center area of an acid slag to promote either an SiO_2:C or an FeO:C reaction for the elimination of carbon. An overall working hypothesis for the above.

2B-104. The Relation of Acid Open-Hearth Furnace Efficiency to Practice. G. R. Fitterer, J. G. Bassett, and J. B. Kopec. *Proceedings of the National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 31, 1948, p. 307-317; discussion, p. 317-319.

The efficiency factor as a guide to apparent efficiency. Variables encountered in practice and overall economics of the metallurgical phases of openhearth operations.

2B-105. (Book.) **Proceedings of the 31st Conference, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,** v. 31, 1948, 440 pages. The Institute, 29 W. 39th St., New York 18, N. Y.

Includes McKune award paper on "Practices Affecting Yields and Surface Quality of Rimmed and Semi-killed Steel"; 10 papers on the basic openhearth, 11 on cold-metal operations and "basic foundry practice"; 6 on refractories and masonry; 8 on metallurgy of the openhearth; 7 on quality of openhearth steel; 3 on the acid openhearth; and accompanying discussion. Individual papers are abstracted separately.

2B-106. (Book.) **Proceedings of the Electric Furnace Steel Conference, American Institute of Mining and Metallurgical Engineers,** v. 5, 1947. 341 pages. The Institute, 29 W. 39th St., New York 18, N. Y.

Papers and discussion presented at the 5th annual conference on electric furnace steel held at Pittsburgh, Dec. 1947. The basic sessions featured the use of oxygen, steel cleanliness, and scrap problems. Individual papers are abstracted separately.

2C—Nonferrous

2C-8. Zinc Volatilization. W. H. Dennis. *Mining Magazine,* v. 80, Feb. 1949, p. 80-85.

Principal methods for treatment of residues and slags.

2C-9. Zinc Industry. R. A. Young. *Journal of Metals; Mining Engineering; Journal of Petroleum Technology,* v. 1, sec. 2, Mar. 1949, p. 78-80.

New developments in roasting, smelting, and sintering.

2C-10. Lead Metallurgists. W. T. Isbell. *Journal of Metals; Mining Engineering; Journal of Petroleum Technology,* v. 1, sec. 2, Mar. 1949, p. 81-83.

1948 developments in smelting and refining.

2C-11. Electrolytic Zinc at Risdon, Tasmania. Major Changes Since 1936. S. W. Ross. *Journal of Metals,* v. 1, sec. 3, Mar. 1949, p. 211-217.

Changes include replacement of two-stage roasting by preliminary roasting followed by flotation of leach residue and roasting of flotation concentrate, continuous leaching of calcine; close control of H-ion concentration during purification for Fe removal; recovery of good grade Co oxide; production of some of the Zn as 99.99% grade; and increased output of cathode Zn by closer electrode spacing. Other plans now underway.

2C-12. A Method for Preparing Boron of High Purity. (In English.) Roland Kiessling. *Acta Chemica Scandinavica,* v. 2, No. 8, 1948, p. 707-712.

Preparing boron of high purity by reduction of BBr_3 vapor with hydrogen in a quartz tube. Apparatus and yield obtained at different temperatures and for different reaction times.

2C-13. Uber die Grundlage des Parkes-Prozesses. (The Principles of the Parkes Process.) E. Henglein and H. Nowotny. *Monatshefte fur Chemie und verwandte Teile anderer Wissenschaften,* v. 79, Dec. 1948, p. 629-637.

Discussion is based on Henglein and Koester's earlier investigation of the ternary systems of Pb-Ag-Zn and Bi-Ag-Zn, since the problem of removing silver from lead by li-

quation is, to a large extent, linked with the constitution diagram. Curves and phase diagrams. 11 ref.

2C-14. New Jersey Zinc Develops a New Condenser. E. H. Bunce and W. M. Peirce. *Engineering and Mining Journal,* v. 150, Mar. 1949, p. 56-62.

Condensing zinc from Zn-retort gases is difficult because these gases de-oxidize a small percentage of the Zn during cooling. This causes the formation of blue powder which must be reworked and accretions of rock oxide which must be removed. New type of condenser in which a motor-driven impeller fills the condensing chamber with showers of liquid Zn to scrub the gas-vapor stream. The heat of condensation is removed by water-cooling coils immersed in the Zn bath.

2C-15. Calculating Charges for the Precipitation Method of Antimony Smelting. Chung Yu Wang. *Engineering and Mining Journal,* v. 150, Mar. 1949, p. 67.

Fundamental reactions of the precipitation method now generally employed for smelting rich antimony sulfide ore. Calculation of iron, soda, and coal charges.

2C-16. Investigation of Parker and Webb Zinc Deposits, St. Lawrence County, N. Y. H. P. Hermance and Robert S. Sanford. *U. S. Bureau of Mines,* Report of Investigations No. 4417, Feb. 1949, 31 pages.

Results of beneficiation tests on the two ores. By milling them together a recovery of approximately 92% can be expected in a concentrate assaying 58% Zn.

2C-17. La fabrication électrothermique de l'Arsenic métallique. (Electrothermic Production of Metallic Arsenic.) Arturo Paoloni. *Journal du Four Electrique et des Industries Electrochimiques,* v. 57, Nov.-Dec. 1948, p. 127-131.

Methods using the ore known as "mispickel" (corresponding, approximately, to the formula $FeAsS$). Basic chemical reactions for the recovery of arsenic, and different types of electric furnaces comparatively analyzed for different methods of arsenic reduction.

2D—Light Metals

2D-6. Manufacture of Pure Titanium. *Light Metal Age,* v. 7, Feb. 1949, p. 16-17. Based on the work of S. F. Wartman and J. R. Long of U. S. Bureau of Mines.

Equipment and procedure to produce Ti in batches of about 15 lb. TiO_2 mixed with carbon is chlorinated to $TiCl_4$. The latter is reacted with Mg in a helium atmosphere to produce Ti and $MgCl_2$. Refining, pressing, sintering, and ingot forging follow. Potential uses.

2D-7. Production of Aluminum in Canada. G. M. Mason. *Canadian Mining and Metallurgical Bulletin,* v. 42 *(Transactions of the Canadian Institute of Mining and Metallurgy,* v. 52), Feb. 1949, p. 73-76.

Production by Aluminum Co. of Canada, Ltd., including extraction of alumina from bauxite.

2D-8. Production of Titanium Powder by the Bureau of Mines. F. S. Wartman. *Metal Progress,* v. 55, Feb. 1949, p. 188-190.

Study of the Kroll process, in which $TiCl_4$ is reduced with Mg in a helium atmosphere at 1475-1650° F. Titanium metal may be recovered by either of two methods from the solid mixture of Ti sponge, $MgCl_2$, and unreacted Mg.

2D-9. The Production of Titanium by the Iodide Process. Bruce W. Gonser. *Metal Progress,* v. 55, Feb. 1949, p. 193-194.

Process depends on formation of volatile titanium iodide by reacting crude titanium with iodine in the absence of any other reactive gas, then depositing the titanium on a hot filament by thermal decomposition of the iodide. The gaseous product of decomposition reacts with more crude metal. Development work done on the process at Battelle Memorial Institute.

2D-10. Induction Melting of Titanium in Graphite. J. B. Sutton and T. D. McKinley. *Metal Progress,* v. 55, Feb. 1949, p. 195.

Equipment for production of 10-lb. ingots. 100-lb. facilities have also been installed recently by du Pont, and procedures are being worked out for production of the large ingots.

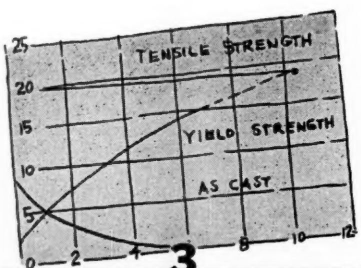
2D-11. Induction Melting and Casting of Titanium Alloys. P. H. Brace. *Metal Progress,* v. 55, Feb. 1949, p. 196-197.

Search for a suitable refractory led to selection of ThO_2. Best results were obtained from a dense high-purity material fired at about 3600° F. The induction-melting apparatus is designed for operation in vacuum or controlled atmosphere.

2D-12. Arc Melting of Titanium. O. W. Simmons, C. T. Greenidge, and L. W. Eastwood. *Metal Progress,* v. 55, Feb. 1949, p. 197-200.

Arc furnaces developed at Battelle Memorial Institute are characterized by a water-cooled tungsten electrode, a water-cooled copper crucible, and provision for an inert argon atmosphere. Mode of operation and advantages.

For additional annotations indexed in other sections, see:
1C-20-21; 16B-30-32; 17-13



3 PROPERTIES

3A—General

3A-40. Properties of Metallic Surfaces. R. M. Burns. "Pittsburgh International Conference on Surface Reactions", 1948, p. VI-VIII.

Previously abstracted from *Journal of the Electrochemical Society.* See item 3a-95, 1948.

3A-41. The "Wetting Effect" Strongly Affecting the Tensile Strength of Solids; "Liquo-Striction," a New Effect Resulting. Carl Benedicks. "Pittsburgh International Conference on Surface Reactions", 1948, p. 196-201.

A wetting effect may either increase or decrease the tensile strength of solids. This effect is said to explain corrosion fatigue, caustic embrittlement, season cracking, and soldering brittleness. "Liquo-striction" is defined as the length increase taking place on wetting. Such a small but measurable effect was shown experimentally to exist and to be affected by surface tension.

3A-42. Reactions of Metals in High Vacua. Earl A. Gulbransen and K. Andrew. "Pittsburgh International Conference on Surface Reactions," 1948, p. 222-236.

The nature of chemical reactions occurring in vacuum and at high temperature on various metals. These reactions are of three classes: those that form a gas; those that react with gases in the vacuum; and those that exchange one gas for another. Apparatus for studying these reactions at temperatures to 1200° C. and at pressures of 10^{-6} mm. Hg or better. A new type of high-temperature vacuum furnace tube which can be sealed to pyrex and is vacuum tight at 1200° C. Results of several experiments. 12 ref.

3A-43. Dislocation Theory and Transient Creep. N. F. Mott and F. R. N. Nabarro. "Report of a Conference on Strength of Solids", *The Physical Society,* 1948, p. 1-19.

The theory of dislocations, and application to the theory of transient creep, in the sense in which the term is used by Andrade (1911, 1914, 1932) and by Orowan (1947). 20 ref.

3A-44. The Creep of Metals. E. N. da C. Andrade. "Report of a Conference on Strength of Solids", *The Physical Society,* 1948, p. 20-26.

Fundamental mechanisms of creep. Apparatus for determination of creep at homogeneous shear. Three methods for maintaining constant stress on specimens under axial tension during testing. 15 ref.

3A-45. The Yield Point of a Metal. Lawrence Bragg. "Report of a Conference on Strength of Solids", *The Physical Society,* 1948, p. 26-29.

Theoretical analysis attempts to take account of the fact that slip alters the state of strain as it proceeds, so that one must consider the altered state in the region behind it as well as the pre-existing strain in the region it has not yet reached.

3A-46. Effect of Solute Atoms on the Behaviour of Dislocations. A. H. Cottrell. "Report of a Conference on Strength of Solids", *The Physical Society,* 1948, p. 30-36; discussion, p. 36-38.

Solute atoms differing in size from those of the solvent can relieve hydrostatic stresses in a crystal and will thus migrate to regions where they can relieve the most stress. As a result they cluster round dislocations forming "atmospheres" similar to the ionic atmospheres of the Debye-Huckel theory. The conditions of formation and properties of these atmospheres; the theory is applied to problems of precipitation, creep, and yield point. 15 ref.

3A-47. On Slip Bands as a Consequence of the Dynamic Behaviour of Dislocations. F. C. Frank. "Report of a Conference on Strength of Solids", *The Physical Society,* 1948, p. 46-51.

It should sometimes be possible to produce a large change in the mode of slip in a single crystal by immersing it in a fluid of like or superior density, and thus suppressing the surface reflection of dislocations.

3A-48. Work-Hardening in Polycrystalline Pure Metals. R. L. Woolley. "Report of a Conference on Strength of Solids", *The Physical Society,* 1948, p. 51-56.

Observation of the plastic deformation of metals when the direction of stressing is reversed gives additional means of checking various theories of work hardening. Experimental results for copper can be ex-

plained by each of three theories, suitably modified.

3A-49. Thermoelectric Properties of Metals—Influence of Cold Work and Impurities. C. Crussard. "Report of a Conference on Strength of Solids", *The Physical Society,* 1948, p. 119-133.

The effect of deformation on thermoelectric properties of a wide variety of ferrous and nonferrous metals near room temperature. This effect consists of two parts, elastic and plastic. These effects on magnetic and nonmagnetic metals.

3A-50. The Excitation and Transport of Metal Vapour in Short Sparks in Air. G. C. Williams, J. D. Craggs, and W. Hopwood. *Proceedings of the Physical Society,* v. 62, sec. B, Jan. 1, 1949, p. 49-61.

Results of a study of excitation temperature in certain spark discharges of accurately known current characteristics. Excitation temperatures are found by measuring intensity ratios for certain spectral lines where the relevant transition probabilities are known. Certain peculiarities relating to the evaporation of electrode metal are described. 28 ref.

3A-51. An Adventure in Metallism. "I. R. Ontowit." *Metal Progress,* v. 55, Feb. 1949, p. 172-175.

The fundamental mechanism of brittle fracture and the extent to which the Charpy notched-bar impact test indicates serviceability. Use of elementary mathematical analysis.

3A-52. High-Temperature Properties of Rotor Disks for Gas Turbines as Affected by Variables in Processing. J. W. Freeman, Howard C. Cross, E. E. Reynolds, and Ward F. Simmons. American Society for Testing Materials, Advance Reprint from *Proceedings of the American Society for Testing Materials,* v. 48, 1948, 36 pages.

Results of high-temperature tests on 24 large forged disks of eight heat resisting alloys, both low and high alloy. Short-time tension, rupture, creep, and stress-time for total deformation characteristics were determined at 1200, 1350, and 1500° F. 14 ref.

3A-53. The Resistivity of Thin Metallic Films. R. A. Weale. *Proceedings of the Physical Society,* v. 62, sec. A, Feb. 1, 1949, p. 135-136.

A theoretical, mathematical analysis.

3A-54. Ferromagnetism at Very High Frequencies. II. Method of Measurement and Processes of Magnetization. M. H. Johnson and G. T. Rado. *Physical Review,* ser. 2, v. 75, Mar. 1, 1949, p. 841-864.

A method for measuring the complex permeability of a ferromagnetic metal. Determination of both components is accomplished by simultaneous measurement of changes in attenuation and phase velocity introduced into a conducting system by the ferromagnetism of one of its walls. An experimental technique involving pulsed magnetic fields is used. Interpretation of results indicates several characteristics of magnetization in iron. Studies of hysteresis phenomena and results for two types of permalloy. 19 ref.

3A-55. Generation of Stresses of the Second Order During Plastic Deformation. (In Russian.) B. M. Rovinskii. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 18, Oct. 1948, p. 1273-1281.

Use of simple experimental methods. On the basis of x-ray investigation, the presence of two different types of 2nd-order stresses in crystals during plastic deformation was established.

3A-56. Increase in the Strength of Metals During Periodic Deformation in Contact With Surface-Active Lubricants. (In Russian.) T. Yu. Lubimova and P. A. Rebinder. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 63, Nov. 11, 1948, p. 159-162.

Newly discovered phenomenon was investigated for several ferrous and nonferrous metals and several surface-active liquids. Method of investigation; composition of surface-active substances. 10 ref.

3A-57. Le module d'élasticité et la limite de fatigue. (Modulus of Elasticity and Fatigue Strength.) Albert Kammerer. *Comptes Rendus* (France), v. 227, Nov. 29, 1948, p. 1144-1145.

Relationship between the two factors, and a proposed formula. Method of application of the proposed equation to metals.

3A-58. Les théories modernes du magnétisme et leurs applications. (Modern Theories of Magnetism and Their Applications.) Louis Néel. *Revue de Métallurgie,* v. 45, Nov. 1948, p. 475-480.

Recent advances in theoretical knowledge concerning magnetic properties of metals and ways in which this information can be applied commercially.

3A-59. L'étalement des liquides sur les métaux en fonction de leur état de surface. (The Spread of Liquid on Metals as a Function of the State of Their Surfaces.) Robert Morlock. *Journées des Etats de Surface,* 1946, p. 219-222; discussion, p. 222.

The above was investigated for different liquids and for different states of surface. Two types of spreading were observed: spreading subject to the law of capillarity and spreading induced by molecular emission depending on the affinity of the liquid and the metal surface.

3A-60. Forgings—Ferrous and Nonferrous. N. Bruce Bagger. *Materials & Methods,* v. 29, Mar. 1949, p. 71-84.

Seven basic categories of forgeable metals from the standpoint of applications. Carbon steels; alloy steels; corrosion-resistant and heat-resistant steels; iron; Cu and Cu-base alloys; Ni and Ni-base alloys; light alloys. Heat treatment; coining, grinding, and straightening; machining; cleaning, plating, and polishing.

3A-61. On the Impact Behavior of a Material With a Yield Point. Merit P. White. *Journal of Applied Mechanics,* v. 16 *(Transactions of the American Society of Mechanical Engineers,* v. 71), Mar. 1949, p. 39-52.

Analyzes longitudinal impact tests made by Clark and Duwez on an iron and a steel with definite yield points. Dynamic stress-strain relations for such materials appear to differ greatly from the static stress-strain relations, contrary to the case for materials without yield points.

3A-62. Effect of Residual Compression on Fatigue. D. Rosenthal, G. Sines, and G. Zizicas. *Welding Journal,* v. 28, Mar. 1949, p. 98s-103s.

In mild steel notched specimens, propagation of a fatigue crack can be slowed down appreciably by submitting the metal around the notch to residual compression. This treatment failed to produce the expected result when applied to a stress-relieved Al alloy. Further experiments are contemplated to ascertain whether the stress-relief heat treatment or the nature of the alloy is the determining factor.

3A-63. Some Fundamental Aspects of the Application of X-Rays to the Study of Locked-Up Stresses in Polycrystalline Metals. W. A. Wood. *Institute of Metals,* Symposium on Internal Stresses in Metals and Alloys, 1948, p. 31-34; discussion, p. 375-397.

Significance of internal strain values as determined by X-ray technique, and of the derived values of the internal stress or stresses in relation to values determined by other methods. When plastic deformation has occurred, the X-ray technique reveals variations in residual strain on a microscopic scale. The mechanical methods measure only the macro effect, whereas the X-ray technique measures the net effect of macro and micro stresses.

3A-64. Classification and Nomenclature of Internal Stresses. E. Orowan. *Institute of Metals,* Symposium on Internal Stresses in Metals and Alloys, 1948, p. 47-59; discussion, p. 398-431.

The main types of internal stress are body-stresses, arising from nonuniformities of external influences; and textural stresses, due to textural inhomogeneities present either initially or produced by plastic deformation or structural changes. The possibility of investigating textural stresses in transparent single crystals or polycrystalline materials by means of polarized light. 28 ref.

3A-65. Laszlo's Papers on Tessellated Stresses: A Review. F. R. N. Nabarro. *Institute of Metals,* Symposium on Internal Stresses in Metals and Alloys, 1948, p. 61-72; discussion, p. 398-431.

Four recent papers by Laszlo, published in *Journal of the Iron and Steel Institute* (1943-1945), are reviewed in detail. 18 ref.

3A-66. Internal Stresses Produced by the Sliding of Metals. F. P. Bowden and A. J. W. Moore. *Institute of Metals,* Symposium on Internal Stresses in Metals and Alloys, 1948, p. 131-137; discussion, p. 398-431.

When a hemispherical steel surface slid over a copper surface a clearly defined track was formed. Tracks were produced under clean and under lubricated conditions. It was concluded that the stresses produced below the surface of the copper were formed by the formation and shearing of metallic junctions during sliding and that continued sliding would give a Beilby film with a distorted layer extending far beneath the surface.

3A-67. Some Internal Stresses in Turbine Rotors. Part I. Expansion Measurements on a Rotating Turbine Wheel. Part II. Estimation of Turbine Shaft Deflection When Heated Due to Relief of Residual Internal Stresses and Lack of Uniformity in Coefficient of Thermal Expansion. M. C. Caplan, L. B. W. Jolley, and J. Reeman. *Institute of Metals,* Symposium on Internal Stresses in Metals and Alloys, 1948, p. 139-152; discussion, p. 398-431.

3A-68. Effects Associated With Stresses on a Microscopic Scale. Lawrence Bragg. *Institute of Metals,* Symposium on Internal Stresses in Metals and Alloys, 1948, p. 221-226; discussion, p. 432-462.

A formula for the limit at which a metal when sheared ceases to behave elastically and begins to undergo plastic deformation. The formula is based on the hypothesis that a slip process confined to a limited volume of the metal represents a local release of energy. It yields estimates of elastic limit of the same magnitude as those actually observed in cold-worked pure metals.

3A-69. Relaxation and Creep of Metals Considering Nonuniform Distribution of Stress. (In Russian.) I. A. Oding. *Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk* (Bulletin of the Academy of Sciences of the USSR, Section of Technical Sciences), Oct. 1948, p. 1561-1575.

Investigation assumed that plastic

deformation proceeds by means of diffusion plasticity in the initial sections of the curves of creep and relaxation. On the basis of the diffusion equation, formulas are proposed for initial sections of relaxation and creep curves, corresponding well with experimental data. 10 ref.

3A-70. (Book.) **Wear, As Applied Particularly to Cylinders and Piston Rings.** F. P. Bundy, T. E. Eagan, and Ralph L. Boyer. 129 pages. Kokosing Press, Mt. Vernon, O. $3.50.

Theory of friction and wear of piston rings and cylinder walls. Constant and variable pressure wear tests with a new type machine. Theoretical considerations of wear and results of wear testing done by Cooper-Bessemer Corp. Design aspects of cylinder and ring wear.

3A-71. (Book.) **Report of a Conference on Strength of Solids Held at the H. H. Wills Physical Laboratory, University of Bristol, on 7-9 July 1947.** 162 pages. 1948. The Physical Society, 1 Lowther Gardens, Prince Consort Road, London, S.W. 7, England.

Nineteen papers classified under the headings: Creep and plastic flow; grain boundaries and recrystallization; precipitation; and fracture. Effects of mechanical working and heat treatment are dealt with. Individual papers are abstracted separately.

3B—Ferrous

3B-27. Mechanical Effects of Carbon in Iron. F. R. N. Nabarro. "Report of a Conference on Strength of Solids", *The Physical Society,* 1948, p. 38-45.

By combining the theories of Snoek and Cottrell with the usual theory of age hardening it is possible to explain the existence of a yield point, quench aging, strain aging, delayed yield, and blue brittleness as consequences of the presence of carbon in iron. 11 ref.

3B-28. Dislocation Theory of Yielding and Strain Aging of Iron. A. H. Cottrell and B. A. Bilby. *Proceedings of the Physical Society,* v. 62, sec. A, Jan. 1, 1949, p. 49-62.

A theory based on the segregation of carbon atoms to form atmospheres around dislocations. The form of such atmospheres and the force needed to release a dislocation from its atmosphere. How yielding and strain aging may be explained by this theory.

3B-29. Investigation of Failures in Railroad Rails and Their Prevention. R. E. Cramer. *American Railway Engineering Association, Bulletin,* v. 50, Feb. 1949, p. 485-489.

Results of examination of 55 failures.

3B-30. Rail Failure Statistics. W. C. Barnes, C. B. Bronson, and L. T. Nuckols. *American Railway Engineering Association, Bulletin,* v. 50, Feb. 1949, p. 489-505.

3B-31. Joint Bar Wear and Failures; Revision of Design and Specifications for New Bars and Bars for Maintenance Repairs. Ray McBrian and others. *American Railway Engineering Association, Bulletih,* v. 50, Feb. 1949, p. 514-516.

A subcommittee progress report.

3B-32. Seventh Progress Report of the Rolling Load Tests of Joint Bars. R. S. Jensen. *American Railway Engineering Association, Bulletin,* v. 50, Feb. 1949, p. 517-532.

Experimental results. Includes corrosion test data.

3B-33. Causes of Shelly Spots and Head Checks in Rail; Measures for Their Prevention. L. S. Crane and others. *American Railway Engineering Association, Bulletin,* v. 50, Feb. 1949, p. 534-535.

It is believed that gage-corner shelling characterized by spalling of metal from the gage corners and developing in a horizontal direction may be retarded by the use of heat treated rail steel. It is also believed that the modified head contours incorporated in recently revised AREA rail sections will materially assist in retarding the onset of shelling.

3B-34. Seven-Year Summary Report of Shelly Rail Investigation at the University of Illinois. R. E. Cramer. *American Railway Engineering Association, Bulletin,* v. 50, Feb. 1949, p. 536-542.

Experimental results.

3B-35. Summary Report on the Examination of Shelled Rails to Joint Contact Committee on Rails of Association of American Railroads and American Iron and Steel Institute. G. K. Manning. *American Railway Engineering Association, Bulletin,* v. 50, Feb. 1949, p. 542-557.

Examination of some 200 shelled spots from the track of 11 major roads indicated that the shelled spots were predominately of surface origin. Evidence indicates that completely pearlitic rail is somewhat more resistant to shelling than is rail containing pearlite plus ferrite; however, it is of doubtful practical importance.

3B-36. Fatigue Tests of Manganese Steel. R. S. Jensen. *American Railway Engineering Association, Bulletin,* v. 50, Feb. 1949, p. 579-588.

Test method and apparatus. Includes corrosion-fatigue results.

3B-37. Internal Stresses in Hardened and Dimensionally Stabilized Steel. L. W. Nickols. *Engineer,* v. 187, Feb. 4, 1949, p. 132.

Results of experiments which prove that considerable residual stress is still present in hardened and stabilized steel. This was shown by the fact that a hardened and stabilized bar of 1 in. diam. and 9 in. length decreased in length by 0.013 in. on removing, by successive layers, 0.6 in. of the diameter. Over a previous 9-year period of observation no dimensional changes had been observed. Calculated stress distribution.

3B-38. The Tensile Yield Strength of Certain Steels Under Suddenly Applied Loads. F. V. Warnock and J. B. Brennan. *Institution of Mechanical Engineers, Proceedings,* v. 159, War Emergency Issue No. 37, 1948, p. 1-10; discussion, p. 14-23.

Dynamic tensile yield stresses were determined for eight steels, including one mild steel, two plain carbon steels, two C-Mn steels, one heat treated alloy steel, and two cast steels. Comparison with static values revealed an increase in yield stress from 21 to 36% for the carbon steels under dynamic loading. This increase diminishes with increase in static yield strength. The annealed cast steels behaved in a similar manner, but the heat treated alloy steel showed no appreciable increase in yield strength. A theory for the variation in sensitivity of yield strength to load rate is proposed.

3B-39. The Dynamic Yield Strength of Steel at an Intermediate Rate of Loading. A. F. C. Brown and R. Edmonds. *Institution of Mechanical Engineers, Proceedings,* v. 159, War Emergency Issue No. 37, 1948, p. 11-14; discussion, p. 14-23.

Dynamic and static tensile yield strengths of eight steels varying from mild steel to a heat treated low-alloy steel were compared, rate of loading in the dynamic tests being such as would occur in a ship under the action of an underwater explosion. Dynamic yield strength of the steels with low static strength was 20-30% greater than their static yield strength but, for the stronger steels, the increase was less, being negligible in the case of the heat treated low-alloy steel.

3B-40. The Effect of Alloys on the Properties of Steel. T. W. Merrill. *Product Engineering,* v. 20, Mar. 1949, p. 124-127.

How Mo, V, Cu, Ni, Cr, and other alloying elements affect hardenability and mechanical properties of low-alloy steel. Factors in choosing steels for ease of machining, welding, and hot and cold working.

3B-41. The Magnetic Properties of Stainless Steel. W. A. Stein. *Electrical Engineering,* v. 68, Mar. 1949, p. 204. Digest of paper to be published in *AIEE Transactions.*

Solenoid-valve manufacturers encountered so many valve failures in attempting to use regular steel in valves exposed to acid vapors that they were forced to resort to the magnetically inferior stainless steels. Hence, six of the more common stainless steels were investigated with respect to magnetic properties.

3B-42. Causes and Prevention of Drill Pipe and Tool Joint Troubles. Part 6. Tool Joints. (Concluded.) H. G. Texter and R. S. Grant. *World Oil,* v. 128, Mar. 1949, p. 106-110, 112; discussion, p. 112, 114.

Wear on the outer surface of tool joints; corrosion-fatigue failures in tool joints; and their minimization.

3B-43. The Specific Heat and Resistivity of High-Purity Iron up to 1250° C. P. R. Pallister. *Journal of the Iron and Steel Institute,* v. 161, Feb. 1949, p. 87-90.

In order to obtain true specific heats at thermal equilibrium, a method was adopted in which the temperature increments were small, and the intervals between observations were occupied by slow heating or cooling of the annealed specimen. Equipment and results. 16 ref.

3B-44. Some Aspects of the Effect of Metallurgical Structure on Fatigue Strength and Notch-Sensitivity of Steel. T. J. Dolan and C. S. Yen. American Society for Testing Materials, Advance Reprint from *Proceedings of the American Society for Testing Materials,* v. 48, 1948, 32 pages.

Extent to which changes in metallurgical structure affect the above. Experimental data from static, fatigue, and impact tests, on two alloy steels and one carbon steel, quenched and tempered to approximately the same hardness level. No direct functional relationship is apparent between notch-sensitivity in fatigue and Charpy testing. 14 ref.

3B-45. The Hardenability Effect of Molybdenum. J. M. Hodge, J. L. Giove, and R. G. Storm. *Journal of Metals,* v. 1, sec. 3, Mar. 1949, p. 218-227.

Results of previous work have indicated significant differences in the above effect in nickel and in chrominum steels. Both end-quench hardenability and isothermal transformation tests on two series of steels of varying Mo content were made in order to shed further light on the mechanism of this behavior.

3B-46. Steels With Higher Than Normal Silicon Content. C. K. Donoho. *Proceedings of the Electric Furnace Steel Conference, American Institute of Mining and Metallurgical Engineers,* v. 5, 1947, p. 151-164; discussion, p. 164-179.

Results of use of silicon as an alloy. Results of tensile tests of keel-block bars and of heat.

3B-47. Effect of Deoxidation on Mechanical Properties. Martin F. Milligan. *Proceedings of the Electric Furnace Steel Conference, American Institute of Mining and Metallurgical Engineers,* v. 5, 1947, p. 180-181; discussion, p. 181-182.

General discussion and a review of previous work.

3B-48. Effect of Some Melting Variables on the Tensile Properties of Acid Electric Steel. Sam F. Carter. *Proceedings of the Electric Furnace Steel Conference, American Institute of Mining and Metallurgical Engineers,* v. 5, 1947, p. 182-197; discussion, p. 197-202.

An investigation at the American Cast Iron Pipe Co. 15 ref.

3B-49. Influence de la surface sur la fatigue des métaux. (Influence of Surface Condition on the Fatigue of Metals.) M. Ros. *Journées des Etats de Surface,* 1946, p. 207-218.

See abstract from *Revue de Métallurgie,* item 3b-29, 1948.

3B-50. Soft Iron for the Electromagnet of a Cyclotron. J. J. Went. *Philips Technical Review,* v. 10, Feb. 1949, p. 246-254.

The more important characteristics of ferromagnetic materials classified in four groups. Possible applications for each group.

3B-51. Internal Stresses in Steel Castings. H. Elliss. *Institute of Metals,* Symposium on Internal Stresses in Metals and Alloys, 1948, p. 85-93; discussion, p. 398-431.

Origin and effects of internal stresses in steel castings. Major factors producing internal stress are casting design, molding technique, and foundry practice; solid contraction in the mold; welding operations; fettling, pickling, and heat treatment processes; and effects of steelmaking practice and steel composition on susceptibility to "hot-tear" formation. 19 ref.

3B-52. Residual Stresses in Beams After Bending. G. Forrest. *Institute of Metals,* Symposium on Internal Stresses in Metals and Alloys, 1948, p. 153-162; discussion, p. 398-431.

Distribution of residual stresses in beams of rectangular and T-section bent in the plastic range. These stresses in certain forms of beams may approach the ultimate tensile stress of the material. Effects of stretch bending and reverse bending.

3B-53. Internal Stresses in Railway Materials. Hugh O'Neill. *Institute of Metals,* Symposium on Internal Stresses in Metals and Alloys, 1948, p. 337-349; discussion, p. 463-484.

Eighteen examples of the occurrence of internal stress, in half of which it is deliberately used for useful purposes. Details of manufacturing stresses in various types of rail, and the effect of high-speed pounding by locomotives. Values of the stress in peened piston rings, shot-blasted spring plates, boiler rivets, and expanded boiler tubes. The effect of service straining on stress removal. Fatigue cracking in axle press-fits, and the shrink-fits of shells and tires. 41 ref.

3B-54. Wechselfestigkeit und Kerbwirkungszahlen von unlegierten und legierten Stählen bei +20 und −78°. (Fatigue Strength and Notch Effect of Unalloyed and Alloyed Steels at +20 and −78° C.) Max Hempel. *Stahl und Eisen,* v. 68, Jan. 1, 1948, p. 25-26.

Effect of temperature on the above as determined by recent German work.

3B-55. Der Einfluss von Pfannenzusätzen auf das Gefuge, die Festigkeitseigenschaften und das Wachsen von Grauguss. (The Effect of Ladle Additions on the Structure, Strength Properties, and Growth of Gray Cast Iron.) C. W. Pfannenschmidt. *Die Neue Giesserei,* v. 36 (new ser., v. 2), Jan. 1949, p. 1-10.

The effect of Ca-Si, SiC, and ferrosilicon on the properties of cast iron. 13 ref.

3B-56. Elongation of Polycrystalline Silicon Iron (4.2% Si) in the Temperature Range From −195° C. to +800° C. (In Russian.) G. N. Kolesnikov, E. S. Yakovleva, and M. V. Yakutovich. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 18, Nov. 1948, p. 1449-1455.

Diagrams of elongation of the above may be classified in two different groups: "low temperature" and "high temperature". Dependence of resistance to deformation, uniform elongation, and sum of elongation and "quasi" uniform elongation on temperature.

3C—Nonferrous

3C-34. Contact Bridge Erosion and Its Prevention. W. G. Pfann. *Electrical Engineering,* v. 68, Mar. 1949, p. 197. Digest of "Bridge Erosion in Electric Contacts and Its Prevention." (To be published in *AIEE Transactions,* v. 67, 1948.)

Mechanism, physical appearance, and minimization of the above, which takes place on breaking of electrical contacts.

3C-35. The Size-Variation of Resistivity for Mercury and Tin. E. R. Andrew. *Proceedings of the Physical Society,* v. 62, sec. A, Feb. 1, 1949, p. 77-88.

Measurements were made of the low-temperature resistivity of mercury wires down to 6μ diameter and of rolled tin foils down to 3μ thickness. A continuous increase of resistivity with decrease of diameter and thickness was considered due to a shortening of the mean free path of the conduction electrons by inelastic collision with the boundary surfaces of the metal. 13 ref.

3C-36. Critical Field Measurements on Superconducting Tin Foils. E. R. Andrew. *Proceedings of the Physical Society,* v. 62, sec. A, Feb. 1, 1949, p. 88-95.

Determined from resistance measurements in a longitudinal magnetic field. Pomeranchuk's relation between foil critical field and the foil thickness was verified, and values of length were found as a function of temperature. 14 ref.

3C-37. A Note on Magnetic Viscosity in Alnico. R. Street and J. C. Woolley. *Proceedings of the Physical Society,* v. 62, sec. B, Feb. 1, 1949, p. 141-142.

The above phenomenon may be satisfactorily accounted for by assuming that, after a sudden change in an external magnetic field applied to the specimen, movement of the domain magnetization vectors is restricted by energy barriers.

3C-38. On the Compressibility of Metallic Cesium. R. M. Sternheimer. *Physical Review,* ser. 2, v. 75, Mar. 1, 1949, p. 888-889.

Explains the break in the volumetric-compressibility curve of cesium at 45,000 kg. per sq. cm., on the basis of electronic structure.

3C-39. Electrical Properties of Pure Silicon and Silicon Alloys Containing Boron and Phosphorus. G. L. Pearson and J. Bardeen. *Physical Review,* ser. 2, v. 75, Mar. 1, 1949, p. 865-883.

Electrical resistivity and Hall measurements were made from 87 to 900° K. on pure Si and Si alloys containing 0.0005-1.0% B or P. X-ray measurements indicate that both elements replace Si in the lattice. Temperature variation of the concentrations of carriers, electrons and holes, and of their mobilities, are determined from resistivity and Hall data for the different samples. 21 ref.

3C-40. Collective Electron Ferromagnetism. III. Nickel and Nickel-Copper Alloys. E. P. Wohlfarth. *Proceedings of the Royal Society,* ser. A, v. 195, Feb. 3, 1949, p. 434-463.

The collective electron treatment is applied to the magnetic and thermal properties of the above alloys. Theoretical background. Variation of the specifying parameters, band width, and interchange interaction, for Ni-Cu alloys, over a wide range of composition. Dependence of electron distribution on temperature. Other temperature effects. Significance of the treatment on electronic heat at high temperatures. 33 ref.

3C-41. Theory of Superconductivity. Kai Chia Cheng. *Nature,* v. 163, Feb. 12, 1949, p. 247.

One can obtain a theory of superconductivity by considering the fact that interaction of electrons with the ionic lattice is appreciable only near the boundaries of Brillouin zones, and particularly strong near the corners of these, indicating that the metal should be superconductive if a set of corners of a Brillouin zone is close to the Fermi surface. This theory explains the fact that the superconductive elements lie exclusively in two columns of the periodic table. A rule for prediction of the superconductivity of alloys and compounds.

3C-42. Vérification de la théorie de Néel pour le champ coercitif des ferronickels en poudre fine. (Verification of Neel's Theory of the Coercive Field of Fine Powdered Ferronickels.) Louis Weil. *Comptes Rendus* (France), v. 227, Dec. 20, 1948, p. 1347-1349.

Experimentally verifies Neel's theory for ferronickels containing 50-90% Ni.

3C-43. Influence de l'état de surface sur la conductibilité des contacts. (Influence of the State of Surface on the Conductivity of Electrical Contacts.) P. de La Gorce. *Journées des Etats de Surface,* 1946, p. 223-226.

Theoretical analysis. Data for Ni, Cu, and Al are interpreted for different surface conditions.

3C-44. The Sodium Tungsten Bronzes. I. Chemical Properties and Structure. M. E. Straumanis. *Journal of the American Chemical Society,* v. 71, Feb. 1949, p. 679-683.

"Tungsten bronzes" (yellow bronze, $NaWO_3$) have metallic properties although they are neither alloys nor intermetallic compounds. Chemical and physical properties; attempts to find the end of the solid-solution series.

3D—Light Metals

3D-16. Hot Tearing of Aluminum Castings. *Iron Age,* v. 163, Feb. 24, 1949, p. 100. Based on article in *Metallurgia,* Jan. 1949 (taken from *Bull. Acad. Sci.,* USSR).

Results of a study of Al-Cu alloys containing 0 to 12% Cu and Al-Si alloys containing 0 to 4% Si. Specially developed quantitative test for resistance to shrinkage stresses, in which a mold having a movable end with a variable weight attached was used.

3D-17. New Alloy Group. *Light Metals,* v. 12, Feb. 1949, p. 106-108.

New group of proprietary British Al-Mg alloys known as the "Vmarilites". Mechanical properties in comparison with other Al alloys, cast

irons, and Cu alloys. Applications. Compositions are not given.

3D-18. Tensile, Creep and Fatigue Properties at Elevated Temperatures of Some Magnesium-Base Alloys. John C. McDonald. American Society for Testing Materials, Advance Reprint from *Proceedings of the American Society for Testing Materials,* v. 48, 1948, 18 pages.

Tests on castings and forgings to be used in engines.

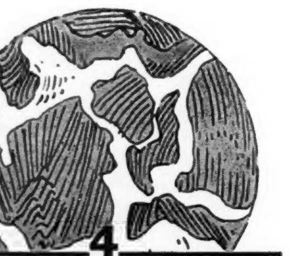
3D-19. Mechanical Properties of Alloys of the Al-Mg System. (In Russian.) E. M. Savitskii and M. A. Tylkina. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 63, Nov. 1, 1948, p. 49-51.

Properties for those compositions close to 50-50. Methods of preparation and testing of very brittle intermetallic phases present in this region. Compositions and mechanical properties.

3D-20. Hall Effect in Liquid Rubidium. (In Russian.) I. G. Fakidov. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 63, Nov. 11, 1948, p. 123-125.

Investigation indicates the presence of electromagnetic and thermomagnetic effects in the liquid metal similar to those in the solid state.

For additional annotations indexed in other sections, see:
2B-94; **4A**-26; **4B**-16-22; **18B**-45; **22B**-98-101; **23C**-18; **23D**-17-21



CONSTITUTION and STRUCTURE

4A—General

4A-18. Deformation of Crystals by the Motion of Single Ions. F. R. N. Nabarro. "Report of a Conference on Strength of Solids", *The Physical Society,* 1948, p 75-90.

A homogeneous stress exerts no force on a vacant lattice site or interstitial ion, and previous estimates of the rate of deformation of a solid due to the migration of lattice defects under stress must be rejected. Surface forces alter the concentrations of defects; and their diffusion from one part of the surface to another leads to a rate of creep dependent on the size of the specimen. The assumption of a mosaic structure removes many of the difficulties, but micro-creep in tin cannot be thus explained. Mechanisms of creep under nonuniform stress and their order of magnitude. Creep phenomena to be expected under neutron bombardment. 24 ref.

4A-19. Recovery and Recrystallization as Processes of Dissolution and Movement of Dislocations. W. G. Burgers. "Report of a Conference on Strength of Solids," *The Physical Society,* 1948, p. 134-136; discussion, p. 136-137.

Recovery is confined to that stage of annealing which is not accompanied by "visible" structural changes, whereas recrystallization is used to denote the appearance and growth of new crystals, eventually followed by "secondary" grain-growth. Recovery versus recrystallization and their dependence on time and temperature of heating; block structure of the crystalline state; and dissolution and movement of dislocations under heat treatment.

4A-20. The Rate of Approach to the Ordered State in Alloys. Louis Weil. "Report of a Conference on Strength of Solids", *The Physical Society,* 1948, p. 138-140.

The rate in alloys such as PtFe is much increased if they are produced in powdered form by the reduction of platinocyanides. This is cited as evidence that diffusion in alloys is due to the motion of vacant lattice points or of similar imperfections.

4A-21. Physical Metallurgists. R. L. Fullman and D. Turnbull. *Journal of Metals; Mining Engineering; Journal of Petroleum Technology,* v. 1, sec. 2, Mar. 1949, p. 98-106.

Developments in physical metallurgy during 1948, including work on deformation, grain growth, transformations, and properties of semiconductors.

4A-22. Quantitative Predictions From Dislocation Models of Crystal Grain Boundaries. W. Shockley and W. T. Read. *Physical Review,* ser. 2, v. 75, Feb. 15, 1949, p. 692.

Dislocation models of grain boundaries have certain quantitative consequences which are directly susceptible to experimental test, so that theoretical and experimental investigations of grain boundaries may furnish a direct proof of the presence of particular arrays of dislocations in solids. Of particular interest are grain boundaries between crystallites differing by a small angular rotation about an important crystallographic direction.

4A-23. Couche de Beilby. Comparaison des preuves électrostatiques et electroniques de son existence. (The Beilby Layer. Comparison of Electrostatic and Electronic Evidence of the Existence of the Beilby Layer.) F. J. Taboury. *Journées des Etats de Surface,* 1946, p. 40-43; discussion, p. 43.

Comparative investigation shows the existence of the Beilby layer under certain conditions. Mechanisms of its formation and dissociation.

4A-24. The Principles of the Interpretation of X-Ray Photographs of Imperfect Crystals. H. Lipson. *Institute of Metals,* Symposium on Internal Stresses in Metals and Alloys, 1948, p. 35-44; discussion, p. 375-397.

The reciprocal lattice of a crystal is a representation of the diffraction pattern of that crystal; it is particularly useful in considering X-ray diffraction by imperfect crystals. The relevant theory is applied to experimental work on the nature of plastic deformation in metals. Results indicate that the broadening of the X-ray reflections is almost entirely due to the presence of "microstresses". 13 ref.

4A-25. Internal Stresses Arising From Transformations in Metals and Alloys. F. C. Thompson. *Intsitute of Metals,* Symposium on Internal Stresses in Metals and Alloys, 1948, p. 227-232; discussion, p. 432-462.

Effects of the internal stresses thus set up in ferrous and nonferrous alloys may modify appreciably the course of the transformations themselves. 18 ref.

4A-26. Diffusion and Precipitation in Alloys. F. R. N. Nabarro. *Institute of Metals,* Symposium on Internal Stresses in Metals and Alloys, 1948, p. 237-250; discussion, p. 432-462.

The theoretical mechanism of diffusion, and factors governing the shape and size of the precipitate. The effects of internal stresses on diffusion and precipitation, and of precipitation on the mechanical properties. 56 ref.

4A-27. Relations d'orientation entre monocristaux métalliques de recristallisation et petits cristaux inclus. (Relationship of the Orientation Between Metallic Recrystallized Monocrystals and Small Crystalline Inclusions.) Paul Lacombe and Aurel Berghezan. *Métaux & Corrosion,* v. 24, Jan. 1949, p. 1-6.

The above was investigated for 99.99% Al, Armco 99.8% Fe, and an Al-Zn solid solution using X-ray diffraction. The presence of two types of small crystalline inclusions was established. Their structure and mechanism of formation.

4A-28. Sur l'existence de petits cristaux isolés dan les monocristaux métalliques de recristallisation et leurs relations d'orientation. (Existence of Isolated Small Crystals in Metallic Monocrystals After Recrystallization and Their Orientation Relationships.) Paul Lacombe and Aurel Berghezan. *Comptes Rendus* (France), v. 228, Jan. 3, 1949, p. 93-95.

The presence of above small crystals (called, by Burgers, "inclusions") in aluminum and iron alloys. Their structure is that of a crossed-twin crystal with similar orientation to that of the large surrounding crystals. Mechanism of the formation of such crystals.

4B—Ferrous

4B-15. Lattice Spacing of Retained Austenite in Iron-Carbon Alloys. W. J. Wrazej. *Nature,* v. 163, Feb. 5, 1949, p. 212-213.

The author has previously suggested that the gamma solid solution in Fe-C alloys is composed of pseudo phases called γG, γS, and γE, the amounts of which depend on the carbon content of the particular alloy, thus making it possible to assume the existence of retained austenite in quenched alloys containing less than 0.6 but more than 0.444% C. Accurate measurement by means of the combined-substance method confirms the continuous change of spacing of retained austenite. Its regularity enables determination of the carbon content of a particular alloy to be made on that basis.

4B-16. The Effect of Ferrite Grain Size on Notch Toughness. J. M. Hodge, R. D. Manning, and H. M. Reichhold. *Journal of Metals,* v. 1, sec. 3, Mar. 1949, p. 233-240.

First of a series of investigations of factors governing notch toughness in ferritic materials. Effect of ferrite grain size, and effect of 3.64% Ni.

4B-17. Recrystallization and Microstructure of Aluminum Killed Deep Drawing Steel. R. L. Rickett, S. H. Kalin, and J. T. Mackenzie, Jr. *Journal of Metals,* v. 1, sec. 3, Mar. 1949, p. 242-251.

Isothermal recrystallization of Al-killed steel of the elongated-grain type takes place in three rather distinct stages: an initial period resembling the start of recrystallization in rimmed steel; a second period during which recrystallization proceeds very slowly; and comparatively rapid recrystallization of the remaining unrecrystallized portion. Temperature variations may be used

to change the recrystallization pattern.

4B-18. Precipitation Phenomena in the Solid Solutions of Nitrogen and Carbon in Alpha Iron Below the Eutectoid Temperature. L. J. Dijkstra. *Journal of Metals,* v. 1, sec. 3, Mar. 1949, p. 252-260.

Precipitation of carbon and nitrogen from solid solution in alpha-iron was studied at different tempering temperatures by internal-friction measurements. Measurements for nitrogen suggested the presence of two successive stages in precipitation. This suggestion was verified by metallographic examinations. 14 ref.

4B-19. Nodular Cast Iron. *Mechanical Engineering,* v. 71, Mar. 1949, p. 236-238. Based on article by J. G. Pearce, *British Information Services,* New York.

New type of cast iron made by adding a small amount of cerium, which causes the grains to form nodules instead of flakes, resulting in a product of greatly improved mechanical properties.

4B-20. Large Crystal Grain Size in Silicon-Chromium Valve Steel. C. C. Hodgson and H. G. Baron. *Journal of the Iron and Steel Institute,* v. 161, Feb. 1949, p. 81-85.

A coarse crystalline condition has been observed in valves and valve forgings made of Si-Cr steel. The influence of heat treatment on microstructure and experiments on plastic deformation. A satisfactory structure can result from widely differing mechanical operations and heat treatments, but certain combinations of these must be avoided if absence of critical grain growth is to be assured.

4B-21. A Constitution Diagram Applicable to Stainless Weld Metal. (In English, French, and German.) R. D. Thomas, Jr. *Schweizer Archiv fur angewandte Wissenschaft und Technik,* v. 15, Jan. 1949, p. 1-6; discussion, p. 12, 14-22 (English sections).

Use of the diagram in dealing with various weld-metal and base-metal compositions. The major application has been the prediction of weld-metal structures obtained on welding dissimilar metals.

4B-22. Reflections on Yielding and Aging of Mild Steel. (In English.) J. H. Palm. *Metalen,* v. 3, Jan. 1949, p. 97-106.

The phenomena of discontinuous yielding and strain-aging, as shown by conventional stress-strain curve. These phenomena cannot be attributed to precipitates in or around the ferrite crystals, but must both be due to carbon and nitrogen in solution in the lattice. Discontinuous yielding may be related to diffusion of C and N in the lattice during elastic straining. Strain aging, as far as the continuous part of the stress-strain curve is concerned, may be caused by migration of C and N to zones with imperfect lattices in which solubility is increased.

4B-23. Susceptibility to Graphitization of Modified Molybdenum Steel. J. A. MacMillan and G. V. Smith. *Welding Journal,* v. 28, Mar. 1949, p. 121s-125s.

Eight experimental heats containing 0.5 or 1% Mo and various amounts of Ti and Cb up to 1%, and two 1% Mo steels of commercial manufacture, all deoxidized with aluminum. Samples were normalized at 1650 or 2000° F. and bead welds laid down before exposing at 1025° F. for intervals totaling 10,000 hr. (1.1 year). The plain Mo steels graphitized to varying degrees whereas no graphite was observed in those containing Ti or Cb.

4B-24. A Note on the Effect of Internal Stresses on the Rates of Transformation in Iron-Nickel Alloys. C. C. Earley. *Institute of Metals,* Symposium on Internal Stresses in Metals and Alloys, 1948, p. 233-236; discussion, p. 432-462.

During the gamma-alpha transformations on continuous rapid cooling of binary Fe-Ni alloys containing up to 27% Ni, the α-phase which forms has a distorted body-centered cubic structure. Variation in lattice strain with Ni content and its removal by suitable annealing treatment. Progress of the isothermal alpha-gamma transformations in strained and strain-free material.

4B-25. Internal Stresses and the Formation of Hair-Line Cracks in Steel. J. H. Andrew and Hsun Lee. *Institute of Metals,* Symposium on Internal Stresses in Metals and Alloys, 1948, p. 265-273; discussion, p. 432-462.

Formation of hair-line cracks in steel is explained on the basis of internal pressures caused by hydrogen. It is suggested that molecular hydrogen could be located at the grain boundaries and that variation of the size of the mosaic blocks may account for the different way in which steels of different compositions and treatments respond to hair-line crack formation.

4B-26. Das veredelte Graphiteutektikum mit kugeligem, sphärolithischem Graphit. (The Improved Graphite Eutectic With Globular and Spheroidal Graphite.) Carl F. Adey. *Die Neue Giesserei,* v. 33-35 (new ser., v. 1), Sept. 1948, p. 67-74.

Reviews recent literature on cast iron of spheroidal structure.

4C—Nonferrous

4C-27. Internal Friction. Léon Guillet. "Report of a Conference on Strength of Solids", *The Physical Society,* 1948, p. 116-119.

First results of a study of internal friction begun in 1943 using Chévenard's microtorsion test apparatus. Data for the solid-solution alloys Cu-Zn, Cu-Sn, and Cu-Al; the order-disorder transformations of Au-Cu alloys; and the contrasting behaviors of the gamma type, $Cu_{31}Sn_8$, and the beta type, CuZn, of intermetallic compound.

4C-28. Hardening of Metals by Internal Oxidation. J. L. Meijering. "Report of a Conference on Strength of Solids", *The Physical Society,* 1948, p. 140-151.

Previously abstracted from *Philips Research Reports.* See item 4c-1, 1948. (See also item 18A-5, 1949.)

4C-29. On the Equations of Motion of Crystal Dislocations. F. C. Frank. *Proceedings of the Physical Society,* v. 62, sec. A, Feb. 1, 1949, p. 131-134.

A theoretical, mathematical analysis.

4C-30. The Brillouin Zones for the Co_2Al_9 and $NiAl_3$ Structures. G. V. Raynor and M. B. Waldron. *Philosophical Magazine,* ser. 7, v. 40, Feb. 1949, p. 198-205.

For the above phases, the most probable Brillouin Zones are characterized by inscribed spheres which can contain 2.12 and 2.00 electrons, respectively, per atom. These values are in close agreement with those calculated on the basis of the theory of the role of transitional metal solutes in Al-rich alloys. The results also support the view that the intermetallic binary and ternary compounds, formed by Al and transitional metals of the first long period, are electron compounds rather than compounds controlled mainly by electrochemical or atomic-size considerations.

4C-31. Recrystallization of Metals Under Stress. J. Neill Greenwood. *Nature,* v. 163, Feb. 12, 1949, p. 248-249.

Summarizes conclusions reached with respect to Pb and its dilute alloys as a result of 14 years of work.

4C-32. The Crystal Structure of Uranium Silicides and of $CeSi_2$, $NpSi_2$ and $PuSi_2$. W. H. Zachariasen. *U. S. Atomic Energy Commission,* AECD-2092, Jan. 6, 1948, 11 pages.

Structures of $CeSi_2$, USi_2, $NpSi_2$, $PuSi_2$, USi, U_3Si_2, and U_3Si. Interatomic distances.

4C-33. The Structures of Some Metal Compounds of Uranium. R. E. Rundle and A. S. Wilson. *U. S. Atomic Energy Commission,* AECD-2388, Nov. 10, 1948, 7 pages.

The compounds UAl_2, UAl_3, UAl_5, UHg_2, UHg_3, UHg_4, and USn_3 all have standard type structures except UHg_4 and UAl_5, which are quite complex.

4C-34. A Tenative Titanium-Nickel Diagram. J. R. Long, E. T. Hayes, D. C. Root, and C. E. Armantrout. *U. S. Bureau of Mines,* Report of Investigations No. 4463, Feb. 1949, 13 pages.

The general features of the diagram up to 40% Ni.

4D—Light Metals

4D-17. Preferred Orientation in Rolled and Recrystallized Beryllium. A. Smigelskas and C. S. Barrett. *U. S. Atomic Energy Commission,* AECD-2063, May, 1948, 8 pages.

Previously abstracted from *Journal of Metals.* See item 4D-16, 1949.

4D-18. Study of Slip in Aluminium Crystals by Electron Microscope and Electron Diffraction Methods. R. D. Heidenreich and W. Shockley. "Report of a Conference on Strength of Solids", *The Physical Society,* 1948, p. 57-75.

Electron microscope results indicate that the slip band is a laminar region resulting from a stepwise slip process. Electron diffraction results indicate that relative rotation of adjacent laminas about the normal to the slip plane occurs as well as simple translation. Electron-diffraction Kikuchi lines are sensitive to crystal imperfections associated with plastic deformation. Hardening produced in surface layers by intermittent stress applications is due to a higher concentration of imperfections in these layers. 22 ref.

4D-19. "Sub-Boundary" and Boundary Structures in High Purity Aluminium. A. Sub-Boundary Structure. P. Lacombe and L. Beaujard. **B. Boundary Structure.** P. Lacombe and N. Yannaquis. "Report of a Conference on Strength of Solids", *The Physical Society,* 1948, p. 91-94.

"Macromosaic structure" has much greater dimensions than "micromosaic" and occurs when large single-metal crystals are prepared either by solidification from the melt or by annealing after critical deformation. Study shows veining or line structure representing boundaries between blocks of slightly differing orientation. The behavior of the grain boundaries of high-purity Al on attack by HCl supports the hypothesis of transition structure. 13 ref.

4D-20. Effect of Recrystallization Texture on Grain Growth. Paul A. Beck and Philip R. Sperry. *Journal of Metals,* v. 1, sec. 3, Mar. 1949, p. 240-241.

Very large grain size was developed in high-purity aluminum by growth at 650° C. in specimens 0.200

irons, and Cu alloys. Applications. Compositions are not given.

3D-18. Tensile, Creep and Fatigue Properties at Elevated Temperatures of Some Magnesium-Base Alloys. John C. McDonald. American Society for Testing Materials, Advance Reprint from *Proceedings of the American Society for Testing Materials,* v. 48, 1948, 18 pages.

Tests on castings and forgings to be used in engines.

3D-19. Mechanical Properties of Alloys of the Al-Mg System. (In Russian.) E. M. Savitskii and M. A. Tylkina. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 63, Nov. 1, 1948, p. 49-51.

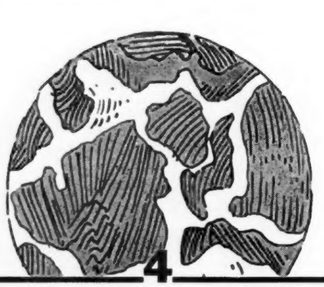
Properties for those compositions close to 50-50. Methods of preparation and testing of very brittle intermetallic phases present in this region. Compositions and mechanical properties.

3D-20. Hall Effect in Liquid Rubidium. (In Russian.) I. G. Fakidov. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 63, Nov. 11, 1948, p. 123-125.

Investigation indicates the presence of electromagnetic and thermomagnetic effects in the liquid metal similar to those in the solid state.

For additional annotations indexed in other sections, see:

2B-94; 4A-26; 4B-16-22; 18B-45; 22B-98-101; 23C-18; 23D-17-21



4 CONSTITUTION and STRUCTURE

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4C-29. On the Equations of Motion of Crystal Dislocations. F. C. Frank. *Proceedings of the Physical Society,* v. 62, sec. A, Feb. 1, 1949, p. 131-134.

A theoretical, mathematical analysis.

4C-30. The Brillouin Zones for the Co_2Al_9 and $NiAl_3$ Structures. G. V. Raynor and M. B. Waldron. *Philosophical Magazine,* ser. 7, v. 40, Feb. 1949, p. 198-205.

For the above phases, the most probable Brillouin Zones are characterized by inscribed spheres which can contain 2.12 and 2.00 electrons, respectively, per atom. These values are in close agreement with those calculated on the basis of the theory of the role of transitional metal solutes in Al-rich alloys. The results also support the view that the intermetallic binary and ternary compounds, formed by Al and transitional metals of the first long period, are electron compounds rather than compounds controlled mainly by electrochemical or atomic-size considerations.

4C-31. Recrystallization of Metals Under Stress. J. Neill Greenwood. *Nature,* v. 163, Feb. 12, 1949, p. 248-249.

Summarizes conclusions reached with respect to Pb and its dilute alloys as a result of 14 years of work.

4C-32. The Crystal Structure of Uranium Silicides and of $CeSi_2$, $NpSi_2$ and $PuSi_2$. W. H. Zachariasen. *U. S. Atomic Energy Commission,* AECD-2092, Jan. 6, 1948, 11 pages.

Structures of $CeSi_2$, USi_2, $NpSi_2$, $PuSi_2$, USi, U_3Si_2, and U_3Si. Interatomic distances.

4C-33. The Structures of Some Metal Compounds of Uranium. R. E. Rundle and A. S. Wilson. *U. S. Atomic Energy Commission,* AECD-2388, Nov. 10, 1948, 7 pages.

The compounds UAl_2, UAl_3, UAl_5, UHg_2, UHg_3, UHg_4, and USn_3 all have standard type structures except UHg_4 and UAl_5, which are quite complex.

4C-34. A Tenative Titanium-Nickel Diagram. J. R. Long, E. T. Hayes, D. C. Root, and C. E. Armantrout. *U. S. Bureau of Mines,* Report of Investigations No. 4463, Feb. 1949, 13 pages.

The general features of the diagram up to 40% Ni.

4D—Light Metals

4D-17. Preferred Orientation in Rolled and Recrystallized Beryllium. A. Smigelskas and C. S. Barrett. *U. S. Atomic Energy Commission,* AECD-2063, May, 1948, 8 pages.

Previously abstracted from *Journal of Metals.* See item 4D-16, 1949.

4D-18. Study of Slip in Aluminium Crystals by Electron Microscope and Electron Diffraction Methods. R. D. Heidenreich and W. Shockley. "Report of a Conference on Strength of Solids", *The Physical Society,* 1948, p. 57-75.

Electron microscope results indicate that the slip band is a laminar region resulting from a stepwise slip process. Electron diffraction results indicate that relative rotation of adjacent laminas about the normal to the slip plane occurs as well as simple translation. Electron-diffraction Kikuchi lines are sensitive to crystal imperfections associated with plastic deformation. Hardening produced in surface layers by intermittent stress applications is due to a higher concentration of imperfections in these layers. 22 ref.

4D-19. "Sub-Boundary" and Boundary Structures in High Purity Aluminium. A. Sub-Boundary Structure. P. Lacombe and L. Beaujard. **B. Boundary Structure.** P. Lacombe and N. Yannaquis. "Report of a Conference on Strength of Solids", *The Physical Society,* 1948, p. 91-94.

"Macromosaic structure" has much greater dimensions than "micromosaic" and occurs when large single-metal crystals are prepared either by solidification from the melt or by annealing after critical deformation. Study shows veining or line structure representing boundaries between blocks of slightly differing orientation. The behavior of the grain boundaries of high-purity Al on attack by HCl supports the hypothesis of transition structure. 13 ref.

4D-20. Effect of Recrystallization Texture on Grain Growth. Paul A. Beck and Philip R. Sperry. *Journal of Metals,* v. 1, sec. 3, Mar. 1949, p. 240-241.

Very large grain size was developed in high-purity aluminum by growth at 650° C. in specimens 0.200

in. thick. These specimens were then rolled to 75% reduction in thickness. After annealing and re-etching, each area corresponding to a single grain before annealing was found to consist of a multitude of new grains with well-developed preferred orientation. Annealing was found to have little grain-growth effect on the well-oriented grains.

4D-21. The Coefficients of Expansion of Some Solid Solutions in Aluminium. W. Hume-Rothery and T. H. Boultbee. *Philosophical Magazine,* ser. 7, v. 40, Jan. 1949, p. 71-80.

The solid solution has a greater coefficient of expansion than the pure metal. In aluminum alloys, formation of the solid solution is accompanied by an expansion of the lattice. It was suggested that solid solutions might show increased or decreased coefficients of expansion when lattice distortion was respectively an expansion or a contraction. Carefully controlled X-ray methods used. Results show that the coefficient of expansion of Al is increased by solution of elements which produce both expansion (Mg) and contraction (Zn, Li) of the lattice of the solvent.

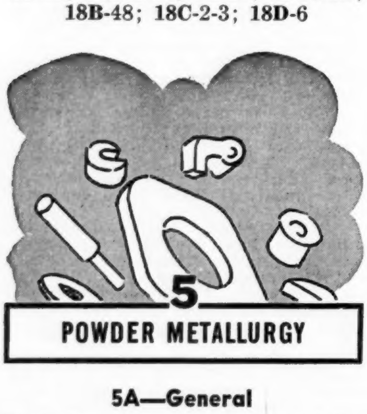
4D-22. Influence de la vitesse d'échauffement sur la grosseur des grains de l'aluminium de pureté 99.5% laminé et recuit. (Influence of Rate of Heating on the Grain Size of 99.5% Pure Rolled and Annealed Aluminum.) J. Hérenguel and F. Santini. *Revue de Métallurgie,* v. 45, Nov. 1948, p. 468-474; discussion, p. 474.

Influence of rate of heating during annealing and of other conditions of heat treatment on grain size and mechanical characteristics of an aluminum alloy of the Mg-Si type and of 99.5% pure Al.

4D-23. Note on the Effect of Cold Work on the Rate of Precipitation in Aluminum-7% Magnesium and Aluminium-8% Magnesium-1% Zinc Alloys. E. C. W. Perryman. *Institute of Metals,* Symposium on Internal Stresses in Metals and Alloys, 1948, p. 251-254; discussion, p. 432-462.

Overstrain prior to low-temperature heat treatment of above homogenized alloys has a marked effect on precipitation of the second phase at temperatures up to 200° C. Such overstrain causes the Mg_2Al_3 to form more continuous grain boundary networks and the stress-corrosion life of the 7% Mg alloy is found to be greatly affected, particularly by the first 1 or 2% of overstrain.

For additional annotations indexed in other sections, see:
2C-13; 3A-64-65; 3C-44; 11-79-82; 18B-48; 18C-2-3; 18D-6



5A—General

5A-13. The Physical Character of the Cohesion Between Powder Particles. J. H. McKee. "Report of a Conference on Strength of Solids", *The Physical Society,* 1948, p. 106-115.

Theory in which the important part played by very fine particles in the sintering process was established. Size distribution below −200 B.S.S. must be considered in prediction of sinterability. 17 ref.

5A-14. Powder Metallurgy. W. S. White. *Canadian Metals and Metallurgical Industries,* v. 12, Feb. 1949, p. 30. Based on lecture by O. W. Ellis.

5A-15. Particle-Size Distribution in Powder Metallurgy. *Industrial Heating,* v. 16, Feb. 1949, p. 252, 254.

Recent Bureau of Standards work on sieving results for different types of powdered metals.

5A-16. Ceramic Developments at the National Advisory Committee for Aeronautics. A. R. Bobrowsky. *Technical Data Digest,* v. 14, Mar. 1, 1949, p. 18-22.

Progress of past year in procedures and equipment for evaluation of ceramic and ceramic-metal materials.

5A-17. Investigation of the Process of Shrinkage of Single-Phase Metal-Ceramic Bodies. III. Laws Determining Volume Changes of Metal-Ceramic Bodies During Firing (Reply to M. Yu. Bal'shin). (In Russian.) V. A. Ivensen. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 18, Oct. 1948, p. 1290-1305.

Critically analyzes Bal'shin's textbook, "Powder Metallurgy". Points out several erroneous assumptions.

5A-18. Certain Comments on Ivensen's Article: "Investigation of the Process of Shrinkage of Metal-Ceramic Bodies." (In Russian.) M. Yu. Bal'shin. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 18, Oct. 1948, p. 1332-1335.

Refutation of Ivensen's criticism of Bal'shin's book. (See item 5A-17.)

5A-19. Where Does Powder Metallurgy Stand Today? H. R. Clauser. *Materials & Methods,* v. 29, Mar. 1949, p. 45-48.

The ability of powder metallurgy to provide low-cost parts with satisfactory properties depends on solution of a number of problems.

5B—Ferrous

5B-5. (Book.) **Determination of the Effect of Particle Size on the Properties of Commercial Iron Powders and Compacts Made From These Powders by Conventional Cold Pressing and Sintering Techniques.** 306 pages. July 1948. Stevens Institute of Technology, Powder Metallurgy Div., Hoboken, N. J. Published by Office of Technical Services, U. S. Dept. of Commerce, Washington.

Results of a series of tests made to determine the effect of particle size on physical properties of seven commercial iron powders and compacts prepared from these powders by standard powder-metallurgy techniques. Scope includes 12 standard tests; 5 special tests; and statistical analysis of tensile strengths of unreduced powders.

5C—Nonferrous

5C-6. Sheath Working of Metal Powders. James R. Long and Earl T. Hayes. *U. S. Bureau of Mines,* Report of Investigations No. 4464, Feb. 1949, 13 pages.

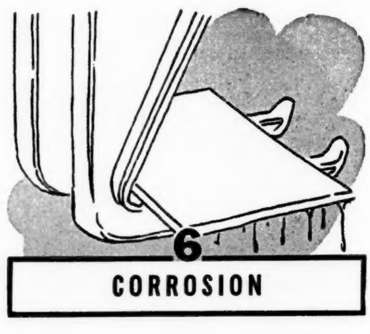
Sheath rolling of green but unsintered powder-metal compacts, as well as rolling of loosely packed powder or mixtures of powders, was investigated. Excellent consolidation was realized, even when the powder was not packed into the sheaths very densely. Elimination of voids was excellent. The homogeneity of the sheath-rolled metal in comparison to pressed and sintered compacts was outstanding.

5D—Light Metals

5D-1. The Consolidation of Titanium Powder by Sheath Rolling. J. R. Long. *Metal Progress,* v. 55, Feb. 1949, p. 191-192.

New method permits fabrication of an almost unlimited mass of metal into a single piece. Sheath-rolled titanium is said to be dense and sound, in contrast with the porous compact obtained by pressing and sintering. Mechanical properties of Ti produced by both methods.

For additional annotations indexed in other sections, see:
2D-8; 11-68



6A—General

6A-23. Pulse Polarization Studies of Corrosion Rates. Glenn A. Marsh and Hugh J. McDonald. "Pittsburgh International Conference on Surface Reactions", 1948, p. 1-5.

A metal specimen is polarized to a high cathodic potential over a brief time interval, and the resulting polarization potential and the depolarization which follows are recorded on a high-speed strip chart. Quantitative data obtained for steel in various organic-liquid solutions. A mechanism to account for the linear relationship of polarization potentials and corrosion rates. 14 ref.

6A-24. Theory and Technique of Measuring Metal Dissolution Rates. Cecil V. King. "Pittsburgh International Conference on Surface Reactions", 1948, p. 5-9.

The diffusion-layer theory with emphasis on modern aspects, and the action of depolarizers on metals in acid solutions, and of other oxidizing agents. Potential of reversible oxidation-reduction systems was altered systematically until the chemical reaction is no longer rapid and the observed dissolution rate no longer diffusion-controlled. 15 ref.

6A-25. Application of the Electron Microscope in Corrosion Studies. E. M. Mahla and N. A. Nielsen. "Pittsburgh International Conference on Surface Reactions", 1948, p. 60-66.

Application to study of intergranular corrosion of stainless steel; to effect of grain orientation on corrosion; to surface film studies; and to miscellaneous replica studies of corrosion.

6A-26. The Mechanism of the Formation of Films on Metals. U. R. Evans. "Pittsburgh International Conference on Surface Reactions", 1948, p. 71-76.

Previously abstracted from *Corrosion and Material Protection.* See item 6a-97, 1948.

6A-27. Reactions of Metals and Alloys Witn Oxygen, Sulphur, and Halogens at High Temperatures. Carl Wagner. "Pittsburgh International Conference on Surface Reactions", p. 77-82.

Previously abstracted from *Corrosion and Material Protection.* See item 6a-126, 1948.

6A-28. A Study of the Difference Effect. Michael A. Streicher. "Pittsburgh International Conference on Surface Reactions", 1948, p. 105-113.

When a metal is made an electrode in an aggressive electrolyte, there may be suppression of attack when the specimen is made a cathode, or rate of dissolution may be increased by making it an anode. However, the rate of normal dissolution may be reduced by the external anodic current. This phenomenon is known as the "difference effect". Effect for Al in NaOH solutions. Extensive theoretical discussion and practical significance. 37 ref.

6A-29. Some Recent Contributions of a British Corrosion Research Group. W. H. J. Vernon. "Pittsburgh International Conference on Surface Reactions", 1948, p. 135-141.

Several recent improvements in corrosion-testing equipment and procedures include: submerged-corrosion test apparatus; electrical methods for study of protective systems; atmospheric corrosion testing; surface-film studies; inhibitor studies; and studies of microbiological soil corrosion. 19 ref.

6A-30. Investigations of Gas-Metal Reactions by Reflection Electron Diffraction. J. W. Hickman. "Pittsburgh International Conference on Surface Reactions", 1948, p. 142-156.

Types of information that may be obtained by using this technique: structural changes that occur during oxidation at constant temperatures; reversible and irreversible transitions that occur when oxide films are heated and cooled; reduction of one oxide to another; changes in oxide-crystal size during oxidation at constant temperature; irreversible solid-phase reactions that occur when oxide films on binary alloys are heated in vacuo; changes in oxide-crystal size as temperature is increased at constant film thickness; oxide-film orientation caused by substrata and growth effects; existence regions of oxide films as a function of time and temperature of oxidation; and relative tendencies of the metals in binary alloys of Mo, Co, W, Ni, and Cr to reach the surface and form oxides. 18 ref.

6A-31. Theoretical and Experimental Investigations About Conjugated Formation of Several Layers in Dry Corrosion. (In French.) G. Valensi. "Pittsburgh International Conference on Surface Reactions", 1948, p. 156-165.

Theoretical analysis of the mechanism of multi-layer formation in dry corrosion of metals having two oxides. Presentation of experimental results for oxidation of Cu at elevated temperature. It is possible to calculate an overall constant of attack and also the composition of the double layer. Presence of an initial oxide film or of occluded gases interferes with the above results. 28 ref.

6A-32. Influence of the Condition of Iron and Copper on Oxidation at High Temperatures. Jacques Benard. "Pittsburgh International Conference on Surface Reactions," 1948, p. 167-172.

Previously abstracted from *Revue de Métallurgie.* See item 6c-30, 1948.

6A-33. The Breakdown of Oxide Films in Acid Vapours. W. Feitknecht. "Pittsburgh International Conference on Surface Reactions", 1948, p. 212-221.

The attack of HCl vapor on Zn, Cd, Ni, Fe, and Cu and the chemical and thermochemical properties of the corrosion products. Samples prepared in different ways were hung in atmospheres of known HCl content. The form of the corrosion products was determined microscopically and the rate of attack was measured by weighing. First stages of the breakdown of the primary oxide film on Zn and Cu were studied by means of the electron microscope. 27 ref.

6A-34. Hydrochloric Acid Versus Construction Materials. *Chemical Engineering,* v. 56, Feb. 1949, p. 243-244, 246, 248, 250, 252, 254.

Part III of a symposium in which a representative group of construction materials are evaluated for services involving hydrochloric acid: "Precious Metals", E. F. Rosenblatt; "Silicones", J. A. McHard and Leon Vanvolkinburg; "Glass Pipe", E. K. Lofberg; "Durimet-20", Walter A. Luce; and "Nickel and Nickel Alloys", W. Z. Friend.

6A-35. Stopping Costly Corrosion With Good Design. *Modern Industry,* v. 17, Feb. 15, 1949, p. 50-53.

A general discussion with practical recommendations.

6A-36. Corrosion of Boiler Generating Tubes. R. L. Rees and E. A. Howes. *Combustion,* v. 20, Feb. 1949, p. 49-51.

Corrosion problems encountered in two British electric generating stations. Corrosion products include considerable quantities of copper.

6A-37. Corrosion. Mars G. Fontana. *Industrial and Engineering Chemistry,* v. 41, Mar. 1949, p. 101A-102A.

Recommended procedures for pilot-plant corrosion testing.

6A-38. What Causes Localized Corrosion? *Steel,* v. 124, Mar. 14, 1949, p. 86-89, 128.

Localized corrosion is often attributed to the presence of impurities. A number of other causes are said to be of far more practical importance. These include metallurgical factors, surface roughness, differential strain, and others.

6A-39. L'épitaxie dans les phénomenes de corrosion. ("Epitaxis" in the Phenomena of Corrosion.) M. Capdecomme. *Journées des Etats de Surface,* 1946, p. 247-249; discussion, p. 249-250.

"Epitaxis" refers to the mechanism by which a continuous crystalline structure, on an atomic scale, is formed joining the base metal and a surface deposit, which may be another metal or an oxide or corrosion product. Results of an experimental study show the importance of this mechanism in metal corrosion, and in mechanical and electrolytic polishing.

6A-40. Corrosion, passivité et passivation au point de vue thermodynamique. (Corrosion, Passivity, and Passivation From the Thermodynamic Point of View.) M. Pourbaix. *Journées des Etats de Surface,* 1946, p. 251-265.

See abstract from *Métaux & Corrosion,* item 6-204, 1947.

6A-41. A Cooperative Approach to Electrolysis Problems. Russell M. Lawall. *Corrosion,* v. 5, Mar. 1949, p. 79-84; discussion, p. 84-85.

Case histories of stray-current and galvanic corrosion caused by street-railway and other electrical distribution systems in the Detroit area.

6A-42. Influence of Residual Stress on Chemical Behaviour. U. R. Evans. *Institute of Metals,* Symposium on Internal Stresses in Metals and Alloys, 1948, p. 291-310; discussion, p. 463-484.

Experiments on oxide-film transfer indicate that a state of stress or strain must have existed during attachment to the metal. Effects of residual stresses on distribution of attack by salt solution; the mechanisms of stress-corrosion cracking and thermal stress relief; effects of compressional surface stresses applied by peening; and use of paints heavily pigmented with metallic Zn to minimize corrosion fatigue and cracking. 73 ref.

6A-43. Chemical Manifestations of Internal Stress. F. H. Keating. *Institute of Metals,* Symposium on Internal Stresses in Metals and Alloys, 1948, p. 311-331; discussion, p. 463-484.

The combined effect of internal stress and a corrosive environment and the significance of stress-corrosion cracking. Stress-corrosion cracking of the common industrial alloys and some examples of cracking in service. A tentative explanation of the mechanism. 98 ref.

6A-44. Concerning Double Ionic Layers on Oxidized Metals. (In Russian.) A. A. Rakov, T. I. Borisova, and B. V. Ershler. *Zhurnal Fizicheskoi Khimii* (Journal of Physical Chemistry), v. 22, Nov. 1948, p. 1390-1396.

The relationship of the capacity of the double layer on a polished and etched nickel electrode to the potential and to the amount of adsorbed oxygen was determined. Decrease of the capacity during adsorption is explained by assuming a decrease in electron concentration in the external layer of the metal lattice which contains embedded oxygen atoms. 11 ref.

6A-45. (Book.) Pittsburgh International Conference on Surface Reactions. 236 pages. 1948. Corrosion Publishing Co., 1117 Wolfendale St., Pittsburgh. $6.50 to those attending the conference; $10.00 to others.

Twenty-eight papers reproduced from typed copy. The majority deal with surface reactions on metals, in theory and in practice; surface catalysis, adsorption and desorption, and theory of film optics are also dealt with. Individual papers are abstracted separately.

6B—Ferrous

6B-42. A New Method of Corrosion Preventive Packaging. A. Wachter. *American Paper Converter,* v. 23, Feb. 1949, p. 14-16.

A slightly volatile corrosion inhibitor (VPI—composition not given) is applied as a coating to wrapping paper and packages for metal objects. VPI is said to inhibit corrosion even when oxygen and water are present; thus a piece of bare polished steel immersed in water containing VPI will not rust.

6B-43. Cathodic Protection. *Light Metals,* v. 12, Feb. 1949, p. 84-93.

Concluding section is concerned with installation details and results obtained in various cases. Comparative cost data for Al, Mg, and Zn anodes.

6B-44. Measurement of Galvanic Currents Around an Underground Structure. N. P. Peifer and F. E. Costanzo. "Pittsburgh International Conference on Surface Reactions", 1948, p. 114-126.

Previously abstracted from *Corrosion and Material Protection.* See item 6b-98, 1948.

6B-45. The Action of Organic Inhibitors in the Acid Attack of Mild Steel. T. P. Hoar. "Pittsburgh International Conference on Surface Reactions", 1948, p. 127-134.

Weight-loss and single-electrode-potential measurements of mild steel in cold and hot 10% H_2SO_4, with

and without addition of various organic inhibitors. In all the experiments in cold acid, and in some of them in hot, the corrosion potential is shifted in the "noble" direction by addition of inhibitor. A new precise technique for weight-loss and corrosion-potential measurements in hot acid solutions. 19 ref.

6B-46. Mechanism of Pigmentation of Anti-Corrosion Paints and Varnishes. Hans Wagner. *Paint and Varnish Production Manager,* v. 29, Mar. 1949, p. 63-64, 66-70.

Electrochemical evaluation. Protection by over-activation of iron surfaces; protection by passivation and oxide-skin formation; and cathodic and anodic effects of pigments.

6B-47. Marine Boiler Deterioration. I. G. Slater and N. L. Parr. *Engineer,* v. 187, Feb. 11, 1949, p. 158-161; Feb. 18, 1949, p. 199-201. A condensation.

The various forms of corrosion, scaling, and failure which occur. Recommendations for minimization.

6B-48. Corrosion in Natural Gas-Condensate Wells; pH and Carbon Dioxide Content of Well Waters at Well-head Pressure. H. Arthur Carlson. *Industrial and Engineering Chemistry,* v. 41, Mar. 1949, p. 644-645.

Corrosion rate was correlated with the pH and CO_2 content. Rate of corrosion could not be correlated with iron nor organic acid content. 10 ref.

6B-49. Weather Resistance of Porcelain Enamels Exposed for Seven Years. William N. Harrison and Dwight G. Moore. *Journal of Research of the National Bureau of Standards,* v. 42, Jan. 1949, p. 43-56.

Previously abstracted from *Journal of the American Ceramic Society.* See item 6B-26, 1949.

6B-50. Influence de l'état de surface sur l'oxydation seche des austénites au Nickel-Chrome et du mode de finition des éprouvettes sur l'hystéresis mécanique des Aciers. (Influence of the State of Surface on the Dry Oxidation of Austenites With Nickel and Chromium, and Influence of the Method of Finishing of the Test Specimen on the Mechanical Hysteresis of Steels.) P. Chevenard and X. Waché. *Journées des Etats de Surface,* 1946, p. 237-241; discussion, p. 241.

The above were investigated with respect to the dry oxidation of chromium ferro-nickel (0.07% C, 9.8% Ni, 19.0% Cr) and the internal friction of carbon steels.

6B-51. Unusual Corrosion in High Pressure Boilers. S. T. Powell and L. G. Von Lossberg. *Corrosion,* v. 5, Mar. 1949, p. 71-78.

Various examples of corrosion embrittlement. Possible explanations for this form of attack. Examples of intercrystalline cracking resulting from high-temperature creep, caustic embrittlement, and hydrogen embrittlement.

6B-52. Galvanic Corrosion in Oil and Gas Well Fluids. F. L. LaQue. *Corrosion,* v. 5, Mar. 1949, p. 86-91.

Possibilities of galvanic action in solutions encountered in oil and gas wells. Factors that may be responsible for the frequent absence of galvanic action. Use of certain metal combinations is believed to be quite safe from the corrosion point of view.

6B-53. Note on Stress-Corrosion Cracking of Steels in the Presence of Sulphur Compounds. W. P. Rees. *Institute of Metals,* Symposium on Internal Stresses in Metals and Alloys, 1948, p. 333-335; discussion, p. 463-484.

Failures of ferrous materials by stress-corrosion cracking, where the corroding agent was probably H_2S or some sulphur-containing compound. Laboratory experiments show that hardened and tempered alloy steels used for gas-cylinder manufacture are susceptible to stress-corrosion cracking in the presence of moist H_2S or CS_2.

6B-54. La corrosion aqueuse du Fer et de l'Acier. Mesures préventives. (Aqueous Corrosion of Iron and Steel. Preventive Methods.) F. N. Speller. *Métaux & Corrosion,* v. 24, Jan. 1949, p. 7-14.

Research on the above in different countries. Various types of corrosion-preventive agents and methods, and their action. 21 ref.

6B-55. Recherches sur la composition variable des couches épaisses de rouille. (Research on the Variation of Composition of Thick Layers of Rust.) Eva Palmaer. *Métaux & Corrosion,* v. 24, Jan. 1949, p. 23-28.

The composition of the rust on objects under the action of the atmosphere or water during periods of time ranging from several up to 1000 years (an ancient sword) was determined. In a thick layer of rust the layer adjacent to the metal consists more of ferrous than of ferric compounds, and ferrous oxides are generally in the form of hydrates. Method of investigation.

How Well Informed Are You?
See Quiz on Page 4

6C—Nonferrous

6C-10. The Corrosion of Zinc and Zinc-Coated Steel in Hot Waters. P. T. Gilbert. "Pittsburgh International Conference on Surface Reactions", 1948, p. 21-49.

Results of a study of the corrosion of zinc and galvanized steel in hard water and in some other solutions, at temperatures up to 85° C. The usual electrochemical relationship between zinc and steel is reversed under certain circumstances; conditions under which this reversal occurs were investigated. A theory of the corrosion of zinc and galvanized coatings in aqueous solutions. 24 ref.

6C-11. Mechanism of the Rapid Oxidation of High-Temperature, High-Strength Alloys Containing Molybdenum. W. C. Leslie and M. G. Fontana. "Pittsburgh International Conference on Surface Reactions", 1948, p. 173-186.

Previously abstracted from *American Society for Metals,* Preprint no. 26, 1948. See items 6c-37, 1948.

6C-12. How to Diagnose Bearing Failures. *SAE Journal,* v. 57, Mar. 1949, p. 68-69. Based on "Engine Bearing Failures," by J. M. Stokely.

Four-step procedure. Different types of bearing corrosion illustrated.

6C-13. On the Oxidation of Metals at Low Temperatures and the Influence of Light. N. Cabrera. *Philosophical Magazine,* ser. 7, v. 40, Feb. 1949, p. 175-188.

Mott's theory is extended to oxides, such as Cu_2O, for which the metal diffuses through the oxide by the mechanism of vacant lattice points. It is also proved that the logarithmic law is valid down to very low temperatures and for pressures of oxygen above about 10^{-4} mm. Hg., independently of temperature and oxide considered. Mott's model is also applied to explanation of the influence of light on the oxidation of Al. 11 ref.

6C-14. Formation of Photographically Active Particles During Atmospheric Corrosion of Metals. (In Russian.) I. L. Roikh. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 63, Nov. 11, 1948, p. 119-122.

Experimental investigation of the kinetics of formation of the above during atmospheric corrosion of Mg, Al, and Zn. Interpretation of the results helps explain the mechanism of atmospheric corrosion.

6C-15. De la surtension de l'Hydrogene, en particulier sur le Nickel, le Tantale et le Niobium. (Overvoltage of Hydrogen, Particularly on the Surface of Nickel, Tantalum, and Columbium.) Eva Palmaer. *Journées des Etats de Surface,* 1946, p. 266-271.

Method and apparatus. Data obtained.

6C-16. The Relation of Composition to Stress-Corrosion Cracking in Copper Alloys. Maurice Cook. *Institute of Metals,* Symposium on Internal Stresses in Metals and Alloys, 1948, p. 73-84; discussion, p. 398-431.

Copper can be regarded as free from liability to stress-corrosion cracking. The possibility of failure in service of Cu-Zn alloys is limited to alloys containing less than 80% Cu, and alloys containing less than 15% Zn are practically immune from season-cracking. Certain elements—including Si, P, As, Sb, and Mn—may improve resistance to stress-corrosion cracking. Similar data on the Al bronzes, cupro-nickels, Si bronzes, and nickel silvers. 40 ref.

6D—Light Metals

6D-7. The Behavior of Oxide Films on Aluminum. Fred Keller and Junius D. Edwards. "Pittsburgh International Conference on Surface Reactions", 1948, p. 202-212.

Information from the literature. Structure and mechanism of protective action. 30 ref.

6D-8. The Rate of Solution of Highest Purity Aluminum in Sodium Hydroxide Solutions. M. E. Straumanis and N. Brakss. *Journal of the Electrochemical Society,* v. 95, Feb. 1949, p. 98-106.

Reaction of aluminum (99.998%) with sodium hydroxide over the entire range of concentration up to 5N. Results help to resolve contradictions in previous publications on the dissolution of aluminum in bases.

6D-9. Protective Films: Natural Formation on Aluminium and Its Alloys. F. A. Champion. *Corrosion,* v. 5, Mar. 1949, p. 92-97.

Previously abstracted from *Metal Industry.* See item 6d-18, 1948.

6D-10. Treatment of Aluminum for Corrosion Prevention. Arthur A. Vernon. *Journal of Chemical Education,* v. 26, Mar. 1949, p. 147-148.

Methods of treatment and theories of the formation of corrosion-inhibiting surfaces.

6D-11. Thickness of Oxide Films Formed on Aluminum in Electrolytes of the 1st Group. (In Russian.) B. V. Deryagin and R. M. Fridlyand. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 18, Nov. 1948, p. 1443-1448.

Determination under different voltages of oxidation, by an optical method. Results of experiment show that, at least in the range 5-170 volts, the oxidation proceeds at a constant potential gradient on the layer equal to 8.5×10^6 volts per cm.

For additional annotations indexed in other sections, see:
3B-32-36-42; 20B-32; 22B-96; 24A-47

CLEANING and FINISHING

7A—General

7A-28. The Reduction of Polishing Costs. S. Wernick. *Journal of the Electrodepositors' Technical Society,* v. 23, 1949, p. 215-235; discussion, p. 235-239. (Preprint.)

Effects of the economics of polishing on British industry. Mechanical and manual methods.

7A-29. Preparation of Metal Surfaces Preparatory to Finishing. V. M. Darsey. *Paint and Varnish Production Manager,* v. 29, Mar. 1949, p. 78-82.

Various methods, including phosphate coating of steel. Tests for surface cleanness; preparation of Zn, Al, and their alloys.

7A-30. Polishing: Procedure—Abrasives—Preparation and Application of Glue. G. F. Weil. *Metal Industry,* v. 74, Feb. 11, 1949, p. 111-112.

Polishing procedure from initial cutting-down to final finishing. Abrasives, glues, felt bobs, cold cements, and mops as polishing materials. (To be concluded.)

7A-31. The Use of Graphite in Metal Finishing Operations. J. R. Murphy. *Metal Finishing,* v. 47, Mar. 1949, p. 51-55.

Uses include high-temperature conveyer lubrication; degreasers and parts-washer lubrication; automatic plating apparatus lubrication; static elimination; electroplating nonconductors; and as stop-off for hot-dip tinning.

7A-32. Reducing Finishing Costs Through Modern Techniques. S. Wernick. *Metal Finishing,* v. 47, Mar. 1949, p. 63-70, 73.

Improved methods for mechanical, chemical, and electrochemical polishing methods, especially electropolishing of nickel. Appendix deals with bright nickel plating.

7A-33. Flame Spraying of Metals and Plastics. F. A. Rivett. *Engineering,* v. 167, Feb. 11, 1949, p. 143-144.

Recent developments.

7A-34. Silicon Monoxide Protected Front-Surface Mirrors. Georg Hass and Noel W. Scott. *Journal of the Optical Society of America,* v. 39, Feb. 1949, p. 179-184.

Evaporation method for producing mirrors with good abrasion, corrosion, and reflection qualities. Aluminum is used because evaporated Al films have high reflectivity in all useful spectral ranges and a finer grain and smoother surface than similar silver coatings. Silicon monoxide was found to produce good-quality protective films.

7A-35. New Developments Widen Metallizing Uses. John E. Wakefield. *Iron Age,* v. 163, Mar. 17, 1949, p. 81-85.

Several recent developments in materials and techniques, plus a better understanding of the structure and properties of sprayed metals, which have expanded the field of metallizing applications. Lubricating properties of sprayed coatings.

7A-36. Finishing Review for 1948. Edward Engel. *Tool Engineer,* v. 22, Mar. 1949, p. 31-32.

Cleaning, plating, aluminum anodizing, surface-finish testing devices, preparation of metals for painting, and painting.

7A-37. Applying Industrial Finishes. G. J. Cavanaugh. *Steel,* v. 124, Mar. 21, 1949, p. 106-108.

Choice of organic material to be used on metal products depends on many factors. Size, shape, and service use discussed in relation to consumption of materials and methods of application.

7A-38. Combatting Corrosion With Rubber Lining. R. McFarland. *Corrosion,* v. 5, Mar. 1949, p. 98-99.

Advantages and limitations of the various types of rubber.

7A-39. Polishing: Dressing Bobs—Mops—Buffing—Automatic Devices. (Concluded.) G. F. Weill. *Metal Industry,* v. 74, Feb. 25, 1949, p. 146-147.

Adhesives, the buffing process, heat development, and automatic devices.

7A-40. (Book.) **Journées des Etats de Surface.** (Proceedings of Conference on Surface States.) 273 pages. 1946. Editions de l'Office Professionnel Général de la Transformation des Métaux, 16, Avenue Hoche, Paris 8, France.

Summary report plus 38 papers presented at conference in Paris, Oct. 1945, and accompanying discussion. The papers are classified under general headings: physicochemical aspects; surface structure; surface state vs. properties; and corrosion. Most of the individual papers are abstracted separately.

7B—Ferrous

7B-43. Finishing Parts for Thor Washing Machines. Fred M. Burt. *Industrial Finishing,* v. 25, Feb. 1949, p. 34-36, 38, 40.

Highlights of conveyerized setup are thorough cleaning and surface-treating of metal parts, prime coating by dipping, final spray coating with heated white enamel, and oven baking.

7B-44. Progress of Fluxing in Hot Galvanizing. *Industrial Heating,* v. 16, Feb. 1949, p. 264, 266, 268, 270. Condensed from paper by A. T. Baldwin.

Progress of past 11 years.

7B-45. Finishing Automobile Components at the Kaiser-Frazer Plant: II. *Industrial Heating,* v. 16, Feb. 1949, p. 294-296, 298-304.

7B-46. Effect of Refractory Mill Additions on Molten Apparent Viscosities of Steel Ground-Coat Enamels. B. D. Bruce and A. V. Sharon. *Journal of the American Ceramic Society,* v. 32, Feb. 1, 1949, p. 41-45.

Rotating-cylinder type viscosimeter and procedure used to determine the above. A blend of three commercial frits was used as the base enamel to study the effect on molten viscosity of various amounts of silica, feldspar, and nepheline syenite.

7B-47. Chromizing With Chromium Chloride. *Iron Age,* v. 163, Feb. 24, 1949, p. 100. Based on article in *Iron and Coal Trades Review,* Jan. 14, 1949 (taken from *Technische Rundschau).*

Method of diffusing chromium into the surface of steel. Steel pieces to be treated are packed in ceramic bodies impregnated with chromium chloride, and heated in a furnace.

7B-48. Metal Finishing Process Information Sheets. IV. George Black.

Product Engineering, v. 20, Mar. 1949, p. 163.

Processes for steel finishing known as Thermoil-Granodine, Houghto-Black, Parkerizing, and Banox are presented in outline form.

7B-49. Reconditioning Flues in the Louisville and Nashville South Louisville Shops. Fred W. Vogel. *Modern Machine Shop,* v. 21, Mar. 1949, p. 98-102, 104, 106, 108, 110, 112, 114-115.

Descaling, repairing, and testing of flues using specially designed tools and work-handling equipment.

7B-50. Burning Tool Equipment for Porcelain Enameling Steel. A. Rasmussen. *Steel Processing,* v. 35, Feb. 1949, p. 79-81, 103.

7B-51. Porcelain Enamel Process Defects; Causes and Possible Cures. Part VIII. Fishscale, Adherence. M. E. McHardy. *Ceramic Industry,* v. 52, Mar. 1949, p. 80-81.

7B-52. Is Architectural Porcelain Enamel a Logical Building Material? Roy E. Dybvig. *Finish,* v. 6, Mar. 1949, p. 34-35, 42.

Qualifies affirmative answer with outline of manufacturing recommendations.

7B-53. An Investigation of the Possibilities of Organic Coatings for the Prevention of Premature Corrosion-Fatigue Failures in Steel. Robert C. McMaster. American Society for Testing Materials, Advance Reprint from *Proceedings of the American Society for Testing Materials,* v. 48, 1948, 20 pages; discussion, p. 18-20.

A few readily available organic coatings were investigated. Intact organic coatings might provide great help, but after failure of the organic coatings, the remaining operating lifetime was found to be about the same duration as that of new, bare specimens. 14 ref.

7B-54. Modern Porcelain Enameling. III. Preparation of Metal. Part II. Alexis J. Hannan and Lee R. Fuller. *Ceramic Industry,* v. 52, Mar. 1949, p. 82.

Equipment used in chemical cleaning or pickling. (To be continued.)

7B-55. Finishing the Lustron Home. Part I. Ezra A. Blount. *Products Finishing,* v. 13, Mar. 1949, p. 20-28.

Flow-coat painting installation of the Lustron Corp.

7B-56. Processing of Titanium Enamel Direct to Titanium Steel. John L. Lannan. *Products Finishing,* v. 13, Mar. 1949, p. 40, 42, 44, 46, 48, 50, 52, 54.

See abstract of article in *Better Enameling,* item 7b-223, 1948.

7B-57. Trouble Shootin'. John L. McLaughlin. *Better Enameling,* v. 20, Mar. 1949, p. 28.

Typical bare spots in enameled ware and their causes.

7C—Nonferrous

7C-9. The Chemical Colouring of Metals: Some Reactions Involving the Slow Liberation of Sulphur, Selenium and Tellurium. M.C.N. Hold and A. M. Ward. *Journal of the Electrodepositors' Technical Society,* v. 24, 1949, p. 33-39. (Preprint.)

Changes in color of surfaces when metals are immersed in solutions of sodium thiosulfate and lead acetate.

7C-10. Adhesion of Polythene to Metal. C. E. Richards and R. L. Bull. *Journal of the Society of Chemical Industry,* v. 68, Jan. 1949, p. 19-22.

Two methods of coating metals with polythene: use of polyisobutylene soaked in a polymerizable compound which is subsequently polymerized *in situ;* and use of molten polythene on a previously prepared lead surface.

7C-11. The Marriage of Silver to Glass; The Scientific Side of Mirror Making. Ambrose R. Nichols, Jr. *Glass Digest,* v. 28, Feb. 1949, p. 10-11, 42-46.

An elementary presentation of fundamental principles involved.

7C-12. Deposition of Pure Boron. II. A Flow Method for the Deposition of Boron on Wires. H. I. Schlesinger, George W. Schaeffer, Glen D. Barbaras, and Thomas Wartik. *U. S. Atomic Energy Commission,* MDDC-1339, Aug. 15, 1944, 16 pages.

Apparatus and method for deposition of boron released by thermal decomposition of diborane. Applications in neutron thermometers and high-temperature coefficient resistors.

7D—Light Metals

7D-12. Evaluation of Polishes for Use on Aluminum Aircraft Surfaces. Roy A. Machlowitz. *ASTM Bulletin,* Jan. 1949, p. 46-49.

The following test methods were employed: caking number, nonflammability, flash point, low-temperature stability, corrosiveness, abrasive number, coarse particles determination, and measurement of performance properties. Results of tests on 11 selected polishes.

7D-13. Alocrom: a New Pre-Treatment. *Light Metals,* v. 12, Feb. 1949, p. 71-77.

New chemical processing system for Al and its alloys said to provide at relatively low cost an excellent base for paint, and to improve resistance to abrasion and to chemical attack. Composition of the solution is not given.

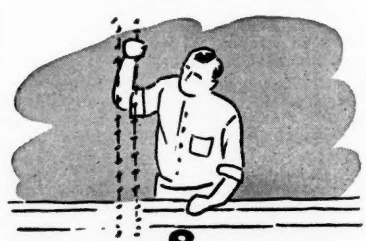
7D-14. How to Apply duPont Vitreous Enamel on Aluminum Alloys. *Modern Metals,* v. 5, Feb. 1949, p. 26-29.

Method of application and testing. Includes metal pretreatment.

7D-15. Process Finishing Magnesium. S. H. Phillips. *Light Metal Age,* v. 7, Feb. 1949, p. 14-15, 22.

A few of the best-known chemical treatments, cleaning procedures and top finishes, particularly as applied to Navy planes by Douglas Aircraft.

For additional annotations indexed in other sections, see:
6A-39; 8-55-67; 14A-27; 16A-21; 19B-36-49; 19D-18



8 ELECTRODEPOSITION and ELECTROFINISHING

8-46. The Measurement of Permeability Characteristics of Anodic Films on Aluminum. Robert L. Burwell, Jr., and Thomas P. May. "Pittsburgh International Conference on Surface Reactions", 1948, p. 10-20.

Previously abstracted from *Journal of the Electrochemical Society.* See item 8-252, 1948.

8-47. Surface Preparation by Electropolishing. Charles L. Faust. "Pitts-

burgh International Conference on Surface Reactions", 1948, p. 187-195.

The process, properties of electropolished surfaces, and applications. 94 ref.

8-48. Hard Chromium Plating of Plastic and Rubber Molds. J. C. Rogers. *India Rubber World,* v. 119, Feb. 1949, p. 605-607.

Process, properties of the product, and applications. Includes surface preparation.

8-49. Direct Nickel Plating of Zinc Diecasting. *Iron Age,* v. 163, Feb. 24, 1949, p. 84.

8-50. A Plater's View of Designing. C. F. Nixon. *Plating,* v. 36, Mar. 1949, p. 235-238.

A general discussion.

8-51. The Plating Step in Clad Steel Manufacture. Albert D. Taylor. *Plating,* v. 36, Mar. 1949, p. 239-245.

Why and how nickel plating is used in the manufacture of stainless-clad and Inconel-clad steels.

8-52. Smoothing Effects of Nickel Deposits. K. S. Willson and A. H. DuRose. *Plating,* v. 36, Mar. 1949, p. 246-251, 275.

By proper choice of plating bath it is possible to obtain deposits that are much smoother than the base metal. This smoothing ability is not related to ability to produce bright coatings. Relative effects of original base-metal roughness and plate thickness.

8-53. Determination of Impurities in Electroplating Solutions. XII. Traces of Chromium in Nickel Plating Baths. Earl J. Serfass, W. S. Levine, and R. M. Davis. *Plating,* v. 36, Mar. 1949, p. 254-257, 260-261, 302.

Reviews the literature. Colorimetric method when appreciable amounts of Al, Cd, Cu, Fe, Pb, Mn, Si, Zn, or Ca are present singly or otherwise.

8-54. Pit Formations in Electrodeposits. E. R. Calderon. *Western Metals,* v. 7, Feb. 1949, p. 27-29.

The origin of the gas bubble which produces the pit; the cause of adherence of the bubble; the difference between adherent and non-adherent bubbles when deposition is accompanied by copious evolution of hydrogen; foreign particles in the bath.

8-55. Close-Fitting Paint Spray Masks by Electroforming. *Die Castings,* v. 7, Mar. 1949, p. 48-51, 53.

Production of the above and use in finishing die castings.

8-56. Electro-Deposition in the Production of Diamond Tools; A Patent Review. Paul Grodzinski. *Electroplating and Metal Finishing,* v. 2, Feb. 1949, p. 78-82.

One of the earliest proposed methods of bonding consists of coating diamond grains with a metallic film by electroplating and then binding the film to a metallic carrier body. This method, with improvements, is still widely used. Other related methods described in the patent literature.

8-57. Electrolytic Tinplating at the Republic Steel Corporation. *Electroplating and Metal Finishing,* v. 2, Feb. 1949, p. 83-88.

8-58. Control of Electroplating Solutions by Analysis and Observation. VI. The Control of Cadmium Cyanide Solutions. K. E. Langford. *Electroplating and Metal Finishing,* v. 2, Feb. 1949, p. 89-91.

Analytical methods for free cyanide and for caustic soda.

8-59. Efco-Udylite Bright Nickel. *Electroplating and Metal Finishing,* v. 2, Feb. 1949, p. 92-94.

A commercial solution sold by a British firm, its basic components, methods for maintenance and use.

8-60. Electroplating in the Spoon and Fork Trade. (Concluded.) *Electroplating and Metal Finishing,* v. 2, Feb. 1949, p. 129-133. Based on a paper by F. R. Hill, with additional information.

Current density, silver anodes, some plating difficulties, bright silver plating, silver finishing, chromium plating, speculum plating, and tarnishing of silver.

8-61. The Electrodeposition Behavior of a Simple Ion. L. B. Rogers and A. F. Stehney. *Journal of the Electrochemical Society,* v. 95, Feb. 1949, p. 25-32.

The Nernst equation predicts that the curve of % element deposited vs. potential should be independent of the amount of reducible element involved providing the "inert" electrode is incompletely covered with deposit, and all other factors are held constant. Deposition curves should shift with changes in electrode area, volume of solution, and size of the deposited atom. 13 ref.

8-62. The Electrodeposition Behavior of Traces of Silver. L. B. Rogers, D. P. Krause, J. C. Griess, Jr., and D. B. Ehrlinger. *Journal of the Electrochemical Society,* v. 95, Feb. 1949, p. 33-46.

By means of radioactivity, the extent of silver deposition on platinum cathodes was determined at various potentials under conditions closely approaching equilibrium. For concentrations of 10^{-7} M or less, the amount of silver was insufficient to cover the electrode and the resulting deposition curves often shifted to a more "noble" potential. The shift, which may be the result of alloy formation, was influenced greatly by the "inert" electrode material. 14 ref.

8-63. Electrodeposition and Electrowinning of Germanium. Colin G. Fink and Vasant M. Dokras. *Journal of the Electrochemical Society,* v. 95, Feb. 1949, p. 80-97.

Aqueous, non-aqueous, and fused electrolytes were studied. Deposition from aqueous baths is apparently limited to thin flashes of metal because of the very low overvoltage of hydrogen on germanium. Cu, Ag, Sn, Co, and Ni were each codeposited with Ge from aqueous solutions. 45 ref.

8-64. Acid Copper for Decorative Plating. John F. Beaver. *Metal Finishing,* v. 47, Mar. 1949, p. 48-50.

Advantages, shortcomings found during the past, recent developments which have eliminated many shortcomings, and present applications.

8-65. Note on an Examination of the Bendix Method for Determining Coating Thickness on Tinplate. F. W. Salt. *Journal of the Iron and Steel Institute,* v. 161, Feb. 1949, p. 118.

Use of the anodic polarization method described by Bendix, Stammer, and Carle in 1943, for routine indication of the time of completion of stripping of tinplate in recovery operations.

8-66. Quelques nouveautés sur le polissage électrolytique. (Some New Developments in Electropolishing.) P. A. Jacquet. *Journées des Etats de Surface,* 1946, p. 52-58.

See abstract from *Metal Industry,* item 7-13, 1946.

8-67. Le polissage électrolytique. Méthode de superfinition. (Electrolytic Polishing. Method of Super-Finishing.) M. Mondon. *Journées des Etats de Surface,* 1946, p. 59-66.

Methods of finishing of moving parts of engines, such as honing, lapping, super-finishing by the Chrysler method, and electropolishing (the latter particularly emphasized).

8-68. L'état de surface et les propriétés des dépots électrolytiques. (State of the Surface and Properties of Electrodeposits.) A. Glazunov and L. Jenicek. *Journées des Etats de Surface,* 1946, p. 85-89.

Influence of the state of surface on the corrosion-preventive properties of electrodeposited layers. Besides the conditions of the electrodeposition, one of the main factors is the state of the surface of the basis metal.

8-69. L'épitaxie dans les dépots électrolytiques. ("Epitaxis" in Electrodeposits.) Georges A. Homes and Marcel Maquestiau. *Journées des Etats de Surface,* 1946, p. 90-91.

"Epitaxis" refers to the mechanism by which a continuous crystalline structure, on an atomic scale, can be formed, joining the base metal and the electrodeposit, resulting in maximum adherence. The laws of "epitaxis" and the influence of various factors on the deposition of Cu on mono and polycrystalline Fe were investigated.

8-70. Plating Room Process Control in Action. Lawrence J. Durney. *Products Finishing,* v. 13, Mar. 1949, p. 32-34, 36, 38.

Causes for plating-room defects and control procedures.

8-71. Where Do We Go From Here? Part I. Joseph B. Kushner. *Metal Finishing,* v. 47, Mar. 1949, p. 71-73.

Future possibilities for technical progress in electroplating. (To be continued.)

8-72. Stress in Electrodeposited Metals. A. W. Hothersall. *Institute of Metals,* Symposium on Internal Stresses in Metals and Alloys, 1948, p. 107-118; discussion, p. 398-431.

Stress is normally measured by the bending of a thin-strip cathode which is plated on one side only; various adaptations of this method. Cr, Co, Cu, Fe, Ni, and Ag are normally deposited in tensile stress which may reach 20-40 tons per sq. in. in Cr, Co, or Ni; Cd, Pb, and Zn deposits are generally in compressive stress which, for Zn, continues to increase after deposition is completed. The magnitude and sometimes the direction of the stress varies with conditions of deposition. 25 ref.

8-73. Sul tempo di fissaggio e sulle possibilita di migliorare la resistenza alla corrosione delle pellicole di ossidazione anodica sull'alluminio. (Concerning the Time of Fixing and the Possibility of Improvement of the Corrosion Resistance of the Anodic Oxidation Layer on Aluminum.) G. Bolognesi. *Alluminio,* v. 17, Nov.-Dec. 1948, p. 572-575.

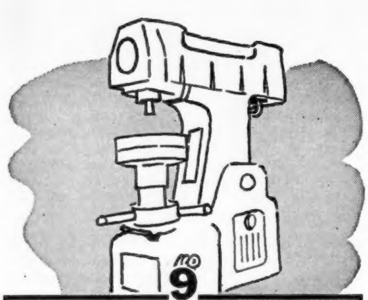
The corrosion resistance of anodic oxidation film was studied as a function of fixing and oxidation time. Treatment of the oxide layer with 5% solution of hexamethylenetetramine prior to fixing seems to improve the corrosion resistance.

8-74. Mechanism of Electrodeposition of Nickel. V. Conditions for Formation of Colloidal Solutions of Basic Salts During Electrolysis. (In Russian.) G. S. Vozdvizhenskii. *Zhurnal Prikladnoi Khimii* (Journal of Applied Chemistry), v. 21, Nov. 1948, p. 1095-1098.

A method for theoretical calculation of the above conditions on the basis of free-energy changes.

For additional annotations indexed in other sections, see:

6D-11; 7A-32-36; 11-74; 15-18; 22C-9; 23B-16; 24A-34; 25C-24



PHYSICAL and MECHANICAL TESTING

9-69. Size Effects in Steels and Other Metals. P. E. Shearin, A. E. Ruark, and R. M. Trimble. "Report of a Conference on Strength of Solids", *The Physical Society,* 1948, p. 158-162. A condensation.

Previously abstracted from "Fracturing of Metals", *American Society for Metals* (also *Transactions of the American Society for Metals*); see item 9a-52, 1948.

9-70. Bibliography on X-Ray Stress Analysis With Subject Index. Herbert R. Isenburger. *St. John X-Ray Laboratory* (Califon, N. J.), 1949, 17 pages.

Consists of 240 references plus a reprint of the author's article, "Stress Analysis by X-Ray Diffraction," *Machinery,* v. 55, July 1947, p. 167-168. (See item 24-222, 1947.)

9-71. A Mathematical Theory of Photo-Viscoelasticity. Raymond D. Mindlin. *Journal of Applied Physics,* v. 20, Feb. 1949, p. 206-216.

A phenomenological law of optical birefringence, induced by small strain in viscoelastic materials, is formulated and applied to an idealized medium. The resulting optical-stress-strain-time-temperature relations are used in finding conditions under which models of viscoelastic materials may be used in the photoelastic method for solving boundary-value problems in the linear theory of elasticity.

9-72. A Method of Determining the Percentage Elongation at Maximum Load in the Tension Test. Paul G. Nelson and Joseph Winlock. *ASTM Bulletin,* Jan. 1949, p. 53-55.

New plotting method and its application to data for various ferrous and nonferrous metals and alloys.

9-73. Approximate Statistical Method for Fatigue Data. R. E. Peterson. *ASTM Bulletin,* Jan. 1949, p. 50-52.

Method believed to give somewhat better information than the measured width of the usual shaded scatter band. Results of application to monel.

9-74. Bonded Resistance Wire Strain Gages Simplify Determination of Creep Measurements. *Steel,* v. 124, Feb. 21, 1949, p. 115. Based on report by C. H. Betts, Canadian Bureau of Mines.

The taking of creep measurements by means of SR-4 gages instead of the conventional extensometer. Method is simple, accurate and sensitive, and avoids the problem of attaching cumbersome and inconvenient mechanical devices to test specimens.

9-75. A Method for Vibration Fatigue Tests of Stranded Conductor. Ai-Ting Yu and Bruce G. Johnston. *Proceedings of the Society for Experimental Stress Analysis,* v. 6, no. 2, 1948, p. 1-6.

Wind-induced vibration of electrical conductors suspended between poles or towers often causes fatigue failure. Test method and apparatus for studying this phenomenon. A combination of the direct-coupled electromagnetic method and the indirect magnetic coupling method was used.

9-76. Strain Gage Survey Around the Supports of a 48-Foot Diameter Hortonsphere. L. P. Zick and C. E. Carlson. *Proceedings of the Society for Experimental Stress Analysis,* v. 6, no. 2, 1948, p. 41-52.

Action of the column-to-shell connections of a 48-ft. diam. Hortonsphere supported on eight tubular columns. Strain-gage technique used.

9-77. A Bonded Wire Strain Gage Type Accelerometer. E. W. Kammer and Sherwood Holt, Jr. *Proceedings of the Society for Experimental Stress Analysis,* v. 6, no. 2, 1948, p. 53-60.

An accelerometer in which a mass, when accelerated, causes axial strains to develop in a thin-walled duralumin cylinder. Bonded wire strain gages are placed on this cylinder to measure these strains. Design considerations, sensitivity, useful range of acceleration, and calibration methods.

9-78. Sensitivity Chart for Wire Resistance Strain Gages. G. L. Rogers. *Proceedings of the Society for Experimental Stress Analysis,* v. 6, no. 2, 1948, p. 61-63.

Problems confronting the engineer in the use of strain gages, with particular reference to selection of the correct type of strain gage for various installations. A labor-saving method involving use of a chart for rapid selection and determination of the output of the proper gage.

9-79. Controlled Impulsive-Load Testing Machine. Robert J. Hansen. *Proceedings of the Society for Experimental Stress Analysis,* v. 6, no. 2, 1948, p. 64-67.

Machine designed and constructed for use in an experimental program on the behavior of reinforced concrete beams subjected to concentrated dynamic loadings. It will produce an impulse the magnitude and duration of which can be controlled and varied from forces up to 10,000 lb. and durations of from 0.01 to 1 sec.

9-80. A Large Displacement Deformeter Apparatus for Stress Analysis With Elastic Models. William J. Eney. *Proceedings of the Society for Experimental Stress Analysis,* v. 6, no. 2, 1948, p. 84-93.

Apparatus in which use of micrometer microscopes is eliminated. It differs from the Beggs deformeter principally in that much larger deformations are employed, the magnitude of gage displacements may be varied to fit the model, and deflections are measured with ordinary engineers' scales. Typical applications.

9-81. Further Properties of Photoelastic Fosterite at Elevated Temperatures. M. M. Leven. *Proceedings of the Society for Experimental Stress Analysis,* v. 6, no. 2, 1948, p. 106-110.

Photoelastic Fosterite has been standardized for manufacture as a styrene-alkyd resin. Properties of this material of importance in photoelastic tests.

9-82. An Example of Efficient Design Through Strain Measurements. John C. New. *Proceedings of the Society for Experimental Stress Analysis,* v. 6, no. 2, 1948, p. 111-119.

The example consists of a torpedo suspension band—a split, circular band about two ft. in diam. and about 4 in. broad. Forged bolting strips are butt welded to each end of the rolled band sheet and a suspension hook is welded at the top.

9-83. Experimental Determination of Aircraft Loads. Bernard D. Haber. *Proceedings of the Society for Experimental Stress Analysis,* v. 6, no. 2, 1948, p. 120-130.

Basic structural problems involved in determining aircraft loads; various load-measuring methods. A general method for determining loads acting on landing gears and truss-type structures is presented. Stress distributions in a few typical semi-monocoque aircraft structures demonstrate the relationship between conventional stress-analysis theory and actual strain-gage measurements.

9-84. Stress-Analysis Beyond the Elastic Range. Alfred M. Freudenthal. *Proceedings of the Society for Experimental Stress Analysis,* v. 6, no. 2, 1948, p. 131-140.

Significance, in terms of stress, of the observable deformation of a material body subject to loads, and of differences in the character of inelastic behavior of different types of materials.

9-85. The Equivalent Static Accelerations of Shock Motions. J. P. Walsh and R. E. Blake. *Proceedings of the Society for Experimental Stress Analysis,* v. 6, no. 2, 1948, p. 150-158.

Use of the reed gage as a method of determining important characteristics of shock motion. The "shock spectrum," thus derived, provides design conditions for "shock-proof" equipment in the form of equivalent static accelerations of the shock motion and a rational method for comparing the severity of different shock motions.

9-86. Comparison of High Temperature Alloys Tested as Blades in a Type B Turbo-Supercharger. W. C. Stewart and H. C. Ellinghausen. *Journal of the American Society of Naval Engineers,* v. 61, Feb. 1949, p. 169-188.

Previously abstracted from *American Society for Mechanical Engineers,* Paper No. 48-A-96, 1948. See item 9-62, 1949.

9-87. A Method of Assessing Transient Stresses in Photoelastic Substances. John S. Stanton. *Review of Scientific Instruments,* v. 20, Feb. 1949, p. 139-140.

A method for measuring the above when they are subjected to dynamic loading forces of any type. Consists essentially of combining techniques of conventional static photoelasticity and of the spark shadowgraph as used in the study of air-shock waves.

9-88. Hardness Jumps During the Coil Test; Peculiar Increase in Hardness. Ernest J. Baty. *Iron and Steel,* v. 22, Feb. 1949, p. 62.

Test for rapid inspection of bars in which they are passed through a solenoid excited by constant alternating current. In tests on high-carbon semi-toolsteel it is quite common for an audible click accompanied by change in meter readings corresponding to about 10 Brinell softening to be heard on passing a bar through the coil. This is readily explainable; but the opposite shift, which occurred repeatedly but less frequently, is not understood.

9-89. The N:S Relationship in Endurance Testing. Michael G. Corson. *Iron Age,* v. 163, Mar. 10, 1949, p. 103-105.

Seeking to reduce the time factor in endurance testing, the author has developed an equation whereby results can be calculated. Accuracy is indicated by application to published data obtained by conventional testing methods. It is applicable to both

ferrous and nonferrous metals. N represents life expectation for a given overload and S the safe stress.

9-90. Fatigue and Static Load Tests of an Austenitic Cast Iron at Elevated Temperatures. W. Leighton Collins. *American Society for Testing Materials,* Advance Reprint from *Proceedings of the American Society for Testing Materials,* v. 48, 1948, 13 pages.

Repeated-load and short-time static tests of unnotched and notched specimens. Results are compared to those published in 1941 for similar tests of a high-strength process cast iron.

9-91. An Hypothesis for the Determination of Cumulative Damage in Fatigue. F. E. Richart, Jr., and N. M. Newmark. *American Society for Testing Materials,* Advance Reprint from *Proceedings of the American Society for Testing Materials,* v. 48, 1948, 33 pages; discussion, p. 32-33.

Hypothesis for determination of the endurance of a material under any arbitrary overstress-cycle pattern and an experimental method of determining relative curves which are said to be sufficient to give correct estimates of endurance. Tests were carried out on large plate fatigue specimens and small rotating-beam specimens to verify the analysis. Values of endurance of specimens under several stress-cycle patterns agreed well with those computed from experimentally determined curves.

9-92. Low Temperature Performance Test on Rupture Diaphragms. W. L. Richardson and G. S. Storer. *U. S. Atomic Energy Commission,* AECD-2268, Aug. 31, 1948, 7 pages.

Results of application to Al and Ag diaphragms of varying thickness.

9-93. Choix de la forme d'entaille dans l'essai de résilience. (Selection of Notch Type in Impact-Strength Testing.) J. Pomey, A. Cadilhac, and R. Coudray. *Revue de Métallurgie,* v. 45, Nov. 1948, p. 455-467.

The influence of notch type and shape on impact strength of different steels was investigated. Various other factors such as composition of steels, heat treatment, direction of rolling.

9-94. Le role de l'état de surface dans les mesures de dureté. (Influence of the State of Surface on Hardness Testing.) P. Bastien and A. Popoff. *Journées des Etats de Surface,* 1946, p. 187-206; discussion, p. 206.

Previously abstracted from *Revue de Métallurgie.* See item 9-46, 1947.

9-95. Practical Applications of Stress Analysis at I-H. John A. Halgren, S. A. Sheridan, and Bernard Goodman. *Iron Age,* v. 163, Mar. 17, 1949, p. 76-80.

Stress analysis studies of mechanical parts at International Harvester, where the original or proposed design was inadequate for the service intended. Use of brittle lacquers and SR-4 strain gages. Residual stress-measurement techniques; methods for material analysis.

9-96. Mechanical Methods for the Measurement of Internal Stress. Hugh Ford. *Institute of Metals,* Symposium on Internal Stresses in Metals and Alloys, 1948, p. 3-11; discussion, p. 375-397.

Various methods including calculation of the stresses from the measurements. Methods applicable to cylinders, thin-walled tubes, flat plates, and bars. 40 ref.

9-97. The Investigation of Internal Stresses by Physical Methods Other Than X-Ray Methods. R. King. *Institute of Metals,* Symposium on Internal Stresses in Metals and Alloys, 1948, p. 13-23; discussion, p. 375-397.

Use of measurements of magnetic properties, electrical resistivity, and internal friction to observe changes in internal stresses produced by treatments such as cold work, quenching, or annealing. Quantitative determinations were made by means of magnetic measurements on plastically stretched and cold-drawn nickel wires.

9-98. Measurement of Internal Stresses by X-Rays. D. E. Thomas. *Institute of Metals,* Symposium on Internal Stresses in Metals and Alloys, 1948, p. 25-30; discussion, p. 375-397.

Strain is indicated by the dimensions of the crystal lattice. By the back-reflection technique very high precision can be obtained if the lattice is sufficiently well formed to give diffracted beams at high angles. Use of normal and oblique incidence; the usual techniques; their advantages and disadvantages.

9-99. A Photoelastic Approach to Stress Modifications Caused by Inhomogeneities. B. Sugarman. *Institute of Metals,* Symposium on Internal Stresses in Metals and Alloys, 1948, p. 281-288; discussion, p. 432-462.

Technique adopted to investigate, by means of photoelastic beam samples, stress concentrations due to inhomogeneities produced by the drilling of holes or repeated patterns of various forms. The investigations were mainly of two-dimensional plastics, but were supplemented by three-dimensional investigations.

9-100. Delayed Cracking in Hardened Alloy Steel Plates. E. H. Bucknall, W. Nicholls, and L. H. Toft. *Institute of Metals,* Symposium on Internal Stresses in Metals and Alloys, 1948, p. 351-365; discussion, p. 463-484.

Wartime investigation into cracking in hardened alloy steel plates and welded structures. The "conical disc test" which was developed to simulate internal stresses in steels of this class. Dependence of cracking susceptibility on composition and on tempering treatment.

9-101. Kugeleindruckversuche bei hohen Geschwindigkeiten. (High-Velocity Ball Impression Tests.) Hubert Titze. *Stahl und Eisen,* v. 68, June 17, 1948, p. 238.

Static and dynamic tests were made with ball-bearing balls to determine the effect of speed of impact on hardness results for cold and hot steels.

9-102. Method of Determination of Resistance of Metals to Fracture Under Tensile Stress. (In Russian.) G. V. Uzhik. *Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk* (Bulletin of the Academy of Sciences of the USSR, Section of Technical Sciences), Oct. 1948, p. 1547-1560.

New method permits easy solution of the problem of absolute value of resistance to shear and tear at each moment of deformation. Typical data for two steels compared with results of other methods of testing. 10 ref.

9-103. Small Polarizing Apparatus Designated "IMASh-KB2" for Investigation of Stress in Structural Members of Machines. (In Russian.) N. I. Prigorovskii and M. F. Bokshtein. *Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk* (Bulletin of the Academy of Sciences of the USSR, Section of Technical Sciences), Oct. 1948, p. 1599-1605.

An apparatus, using the polarization optical method of investigation with a transparent model, for study of stress distribution in structural parts.

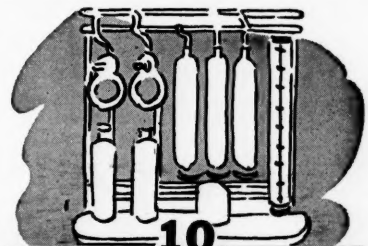
9-104. New Methods of Bearing-Material Testing. (In Russian.) M. M. Khrushchov. *Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk* (Bulletin of the Academy of Sciences of the USSR, Section of Technical Sciences), Oct. 1948, p. 1613-1620.

Specially developed methods and apparatus used for testing the wear-in property, the abrasive wear, the microhardness, and the fatigue strength of bearing alloys.

9-105. (Book.) **An Introduction to Photo-Elastic Analysis.** A. W. Hendry. Blackie and Son, Ltd., 66, Chandos-place, London, W.C. 2, England. 7s. 6d. net.

Begins by outlining the relevant elastic and optical theory, goes on to show how interference-fringe stress patterns are produced and interpreted, and then describes apparatus and materials, mentioning many useful details about the preparation of models, the technique of testing, and photography and analysis of records. Includes a brief description of three-dimensional "frozen-stress" photoelastic methods, and a selection of examples of two-dimensional stress problems in mechanical and structural engineering.

For additional annotations indexed in other sections, see: 3A-44-63-70; 3B-36-38; 24A-26-27



10 ANALYSIS

10A—General

10A-36. The Spectrochemical Determination of Beryllium. L. T. Steadman. *U. S. Atomic Energy Commission,* AECD-1957, May 12, 1948, 4 pages.

Details of method.

10A-37. The Estimation of Cobalt in Bright Nickel Plating Solutions. H. D. Carter. *Journal of the Electrodepositors' Technical Society,* v. 24, 1949, p. 27-31. (Preprint.)

The method of Dickens and Massen is said to be both accurate and rapid.

10A-38. The Determination of Radioactive and Stable Tracer Isotopes. *Analyst,* v. 73, Dec. 1948, p. 644-662.

"The Measurement of Beta-Activity," A. G. Maddock; "The Measurement of Radio-Isotopes," F. E. Whitmore; "The Measurement of Abundance Ratios of Non-Radioactive Isotopes," E. R. S. Winter; "The Measurement of Stable Isotope Abundance Ratios," Eric R. Roberts; and "Tracers in Biochemical Investigations," W. J. Arrol. 66 ref.

10A-39. Gravimétrie automatique en chimie minérale. (Automatic Gravimetric Analysis and Its Application to Mineral Chemistry.) Clément Duval. *Analytica Chimica Acta,* v. 2, Dec. 1948, p. 432-440.

The Chevenard thermobalance, which records photographically as a function of time and, if desired, of temperature, the gain or loss of weight of a substance. Typical examples of use in inorganic gravimetric analysis. 23 ref.

10A-40. Statistical Aspects of Chemical Analysis. (In English.) Eric C. Wood. *Analytica Chimica Acta,* v. 2, Dec. 1948, p. 441-450; discussion, p. 450-451.

Fundamental principles; methods of sampling; use of "quality control" charts in analytical work. A method of obtaining maximum information from analytical investigations involving estimation of a ratio. 24 ref.

10A-41. Standardization of Analytical Procedures. (In English.) H. A. J. Pieters and R. Schmidt. *Analytica Chimica Acta,* v. 2, Dec. 1948, p. 465-474; discussion, p. 475.

The present situation in the field of standardization and the development of an organization for standardization of analytical procedures. Rules for unification in the description of procedure; necessity for standardizing chemical glassware and commonly used apparatus.

10A-42. Standardization and Codification of Analytical Methods. (In English.) R. J. Forbes. *Analytica Chimica Acta,* v. 2, Dec. 1948, p. 476-479.

Need for the above.

10A-43. Isotopes as Tracers in Analytical Chemistry. (In English.) A. H. W. Aten, Jr. *Analytica Chimica Acta,* v. 2, Dec. 1948, p. 492-500; discussion, p. 500.

Availability of radioactive and of concentrated heavy isotopes in Holland and instruments for their measurement. Principles of the application of tracers in analytical chemistry and examples of the different kinds. Determination of elements by induced radioactivity and by neutron absorption. 38 ref.

10A-44. Modern Trends of Polarographic Analysis. (In English.) J. Heyrovsky. *Analytica Chimica Acta,* v. 2, Dec. 1948, p. 533-541.

A review. 30 ref.

10A-45. Controlled Potential Electroanalysis. (In English.) James J. Lingane. *Analytica Chimica Acta,* v. 2, Dec. 1948, p. 584-600; discussion, p. 601.

Fundamental principles. A potentiostat which automatically maintains the potential of a working electrode constant during an electrolysis. Cells for different applications. Typical applications include electrogravimetric determinations of metals, electrolytic separation of metals with mercury and platinum cathodes prior to polarographic analysis, coulometric analysis, identification of oxidation states that correspond to polarographic waves, and electrolytic preparation of organic and inorganic compounds. 16 ref.

10A-46. Amperometric Titrations. (In English.) I. M. Kolthoff. *Analytica Chimica Acta,* v. 2, Dec. 1948, p. 606-621; discussion, p. 621.

The most important literature and applications of amperometric titrations since 1941. Recommends more widespread application. 39 ref.

10A-47. Les méthodes par absorption en chimie analytique. (Absorption Methods in Analytical Chemistry.) G. Duyckaerts. *Analytica Chimica Acta,* v. 2, Dec. 1948, p. 649-663; discussion, p. 663.

Development of colorimetric absorptiometric methods over the past 25 years.

10A-48. Colorimetric and Photometric Absorption Analysis. (In English.) D. J. Coumou. *Analytica Chimica Acta,* v. 2, Dec. 1948, p. 693-703; discussion, p. 704.

A survey of methods and apparatus. 20 ref.

10A-49. The Polarographic Method for Determining Trace Elements in Rocks and Minerals. Esther W. Claffy. *American Journal of Science,* v. 247, Mar. 1949, p. 187-199.

Describes method particularly suited for quantitative analysis of amounts in the range of 10^{-2}M. to 10^{-5}M., for many metals and nonmetals occurring in rock and minerals.

10A-50. Effect of Alumina on Open-Hearth Roof Life. H. M. Graul and E. B. Snyder. *Proceedings of the National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 31, 1948, p. 135-142; discussion, p. 151-156.

Method for determining alumina which is simple and reliable. Plus error of 0.02% can be expected. Results of service tests. 11 ref.

10A-51. Spectrographic Analysis of Alumina in Silica Brick. P. R. Irish. *Proceedings of the National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 31, 1948, p. 143-151; discussion, p. 151-156.

Fusion furnace used in preparing sample. Results of routine analysis. Accuracy and precision.

10A-52. Versuche zur elektrolytisch-potentiometrischen Analyse. (Experiments on the Electrolytic-Potentiometric Method of Analysis.) Willy Oelsen and Peter Göbbels. *Stahl und Eisen,* v. 69, Jan. 20, 1949, p. 33-38; discussion, p. 38-40.

This method for analyzing metals dispenses with standard solutions. Instead, the kinds and quantities of elements are directly determined by application of Faraday's law of electrolysis. This method is especially well adapted to microanalysis. Two types of equipment. 10 ref.

10A-53. Notes on the Quantitative Determination of Tungsten. (In Russian.) S. I. Gusev and V. I. Kumov. *Zhurnal Analiticheskoi Khimii* (Journal of Analytical Chemistry), v. 3, Nov.-Dec. 1948, p. 373-376.

Possibility of solution of ferrotungsten in oxalic acid and 30% H_2O_2, thus eliminating the necessity for treatment with HF. 20 ref.

10B—Ferrous

10B-19. Ferrous Metallurgy. H. F. Beeghly. *Analytical Chemistry,* v. 21, Feb. 1949, p. 241-246.

Tools, methods, and procedures for determining either the presence or amount of an element or compound in a ferrous matrix. 194 ref.

10B-20. Rapid Tests for Identifying Alloy Steels. Elbert C. Kirkham. *American Machinist,* v. 93, Feb. 24, 1949, p. 93-104.

Spot-test qualitative system and test kit. Some practical applications are cited. 32 ref.

10B-21. Amyl Acetate: A Solvent for the Separation of Iron in Metallurgical Analysis. J. E. Wells and D. P. Hunter. *Analyst,* v. 73, Dec. 1948, p. 671-673.

Method for separation of iron from chloride-sulfate solutions of steel has marked advantages over the more usual ether separations.

10B-22. Influence of the Reagent Concentration on the Colorimetric Copper Determination With Sodium Diethyl Dithiocarbamate (Abbreviated: D D.C.) and Its Importance for the Determination of Copper in the Presence of Large Amounts of Iron. (In English.) P. Karsten, S. C. Rademaker, and J. J. Walraven. *Analytica Chimica Acta,* v. 2, Dec. 1948, p. 705-710; discussion, p. 710-711.

10B-23. An Electronic Carbon Analyzer for Steel Samples. A. C. Chamberlin and E. J. Serfass. *Proceedings of the National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 31, 1948, p. 266-278.

Construction, operation and properties of an electronically operated carbon analyzer, designed for direct-reading to 0.01% carbon. 17 ref.

10C—Nonferrous

10C-35. Nonferrous Metallurgy. H. V. Churchill. *Analytical Chemistry,* v. 21, Feb. 1949, p. 246-249.

Scope of use of techniques and procedures and their application to analysis of nonferrous metals. Trace analysis, colorimetric methods, and polarographic procedures. 33 ref.

10C-36. Determination of Zirconium by Precipitation From Homogeneous Solution. Hobart H. Willard and R. B. Hahn. *Analytical Chemistry,* v. 21, Feb. 1949, p. 293-295.

Method for determining in samples containing 2 to 60 mg. of zirconium oxide, for samples containing 0.2 to 200 mg.

10C-37. Shop Tests for Identifying Non-Ferrous Metals. *American Machinist,* v. 93, Feb. 24, 1949, p. 127.

A tabulation.

10C-38. The Quantitative Spectrographic Analysis of the Rare Earth Elements. III. Determination of Major Constituents in Complex Mixtures. Velmer A. Fassel. *Journal of the Optical Society of America,* v. 39, Feb. 1949, p. 187-193.

Previously abstracted from *U. S. Atomic Energy Commission,* MDDC-1777. See item 10c-42, 1948.

10C-39. L'analyse polarographique appliquée aux produits de la métallurgie du zinc. (Polarographic Analysis Applied to Products of the Metallurgy of Zinc.) René Favre. *Analytica Chimica Acta,* v. 2, Dec. 1948, p. 556-564; discussion, p. 564-565.

Estimation of traces of Pb, Cd, and Zn in concentrations up to 10%.

10C-40. Nioxime: A Reagent for Palladium. Roger C. Voter, C. V. Banks, Harvey Diehl. *U. S. Atomic Energy Commission,* MDDC-1095, July 9, 1947, 4 pages.

See abstract from *Analytical Chemistry,* item 10c-59, 1948.

10C-41. Quantitative Approximate Semimicro Determination of Cerium and Total Rare Earths in Ores and Minerals. (In Russian.) N. S. Poluektov and M. P. Nikonova. *Zhurnal Analiticheskoi Khimii* (Journal of Analytical Chemistry), v. 3, Nov.-Dec. 1948, p. 354-361.

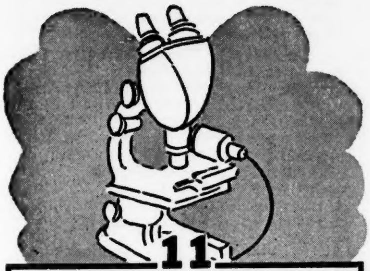
A method particularly adaptable for analysis under field conditions is proposed. Cerium is determined by a colorimetric reaction with H_2O_2 in carbonate solution in the presence of sodium citrate; total rare-earth oxides are determined by semimicrogravimetric method.

10D—Light Metals

10D-11. Studi polarografici applicati alla metallurgia dell'alluminio: determinazione del sodio nei fanghi rossi. (Polarography as Applied to Aluminum Metallurgy. Determination of Sodium in Red Mud.) G. Semerano and V. Capitanio. *Alluminio,* v. 17, Nov.-Dec. 1948, p. 566-571.

A polarographic method for sodium is based on the solubility of Al_2O_3 in tetraethylammonium and on the possibility of electrodeposition of sodium from such a solution. Precision is ± 1%. 29 ref.

For additional annotations indexed in other sections, see:
8-53-58



APPARATUS, INSTRUMENTS and METHODS

11-52. Photo-Density Method of Determining the Relative Penetration of Diffused Sodium 24 Tracer into Glass. James R. Johnson. *Journal of Applied Physics,* v. 20, Feb. 1949, p. 129-131.

Compared with a thin-section analysis method. It is believed applicable to similar tracer problems such as metal-diffusion studies.

11-53. The Measurement of Forces Resisting Armor Penetration. A. Victor Masket. *Journal of Applied Physics,* v. 20, Feb. 1949, p. 132-140.

Experimental and theoretical status of the optical chronograph. The instrument, together with a simple procedure for analysis of data, is capable of yielding the position, velocity, and deceleration of a non-plastically deforming small-arms projectile during the armor penetration process, which lasts 30 to 150 microsec. The precision of the derived decelerations is sufficient to permit evaluation of strain-rate and inertia effects during high-speed indentation by means of conical indenters at strain-rates approaching 2×10^5 per sec.

11-54. Density and Packing in an Aggregate of Mixed Spheres. Douglas Rennie Hudson. *Journal of Applied Physics,* v. 20, Feb. 1949, p. 154-162.

Packing of unequal spheres is important in handling industrial substances such as nickel shot, coal, and iron ore. Less directly, the question is of importance in industrial sieving and grading, ore dressing, concrete technology, and soil physics, and in all processes of grinding by attrition. Mathematical analysis of the types of packing which exist and application to commercial materials. 11 ref.

11-55. Particle Size Determination by Soft X-Ray Scattering. K. L. Yudowitch. *Journal of Applied Physics,* v. 20, Feb. 1949, p. 174-182.

Small angle X-ray scattering measurements are made on samples of colloidal gold of radius 50 to 400 angstroms. The usual method of analysis is shown to be valid only for particles of radius less than 120 wave-lengths. Extension of the method to larger particles is achieved, giving improved electron-microscope correlation. Use of longer wave-lengths and optimum shaped slits is shown to reduce geometry errors sufficiently to give clear evidence of predicted intensity maxima. 24 ref.

11-56. A Positive-Replica Technique for Electron Microscopy. C. M. Schwartz, A. E. Austin, and P. M. Weber. *Journal of Applied Physics,* v. 20, Feb. 1949, p. 202-205.

Technique which reproduces the contour variations of the specimen surface, and permits direct visual interpretation of elevation. The method utilizes two resins, each mutually insoluble in the solvent for the other, specifically, polyvinyl alcohol plus Formvar. Application to wear-test specimens.

11-57. Small Spherical Particles of Exceptionally Uniform Size. Robert C. Backus and Robley C. Williams. *Journal of Applied Physics,* v. 20, Feb. 1949, p. 224-225.

Discovered in polystyrene latex during electron-microscope work. Three applications of the particles in electron microscopy, based on their uniform size.

11-58. Grain Growth in Octachloropropane. W. C. McCrone and P. T. Cheng. **Comments on "Grain Growth in Octochloropropane".** Paul A. Beck. *Journal of Applied Physics,* v. 20, Feb. 1949, p. 230-231.

Octachloropropane can be used to study grain growth in metals because of its analogous behavior. Advantages over use of the metals themselves are lower temperature range, transparent specimens, and simpler techniques. The isothermal grain-growth relationship for pure metal and certain pure solid solutions.

11-59. Comments on "Electronic Radiography and Microradiography". Herman E. Seemann. *Journal of Applied Physics,* v. 20, Feb. 1949, p. 231-232.

A few suggestions regarding technique described by J. Trillat in above paper (see item 11-224, 1948).

11-60. Measuring Wing-Surface Smoothness: a Method of Obtaining Photographic Records Over Continuous Profiles. E. R. Arbon, R. H. Blyth, and L. C. M. Daniels. *Aircraft Production,* v. 11, Feb. 1949, p. 39-43.

Apparatus and procedure for the above. The equipment includes camera, oscilloscope, amplifier, exploring "mouse" and calibrating unit.

11-61. The Preparation of Single Crystals for the Study of Surface Reactions. Allan T. Gwathmey. "Pittsburgh International Conference on Surface Reactions", p. 66-70.

Method and certain conclusions concerning the nature of a metal surface during reaction. Special emphasis is placed on the relationship between the apparent geometric surface and the crystal planes within the metal.

11-62. Studies of Metal Surfaces by Low Temperature Gas Adsorption. Paul H. Emmett. "Pittsburgh International Conference on Surface Reactions", p. 82-90.

By measuring low-temperature adsorption isotherms of suitable inert gases near their boiling points, it it possible to obtain reliable estimates of absolute surface areas. By appropriate choice of adsorbate, it is possible to measure surfaces as small as 100 sq. cm. with a reproducibility of perhaps 10%. Metal catalysts were studied extensively by this method. 17 ref.

11-63. Optical Determination of Thin Films on Reflecting Bases in Transparent Environments. A. B. Winterbottom. "Pittsburgh International Conference on Surface Reactions", p. 91-100.

Previously abstracted from *Journal of the Optical Society of America.* See item 11-14, 1949.

11-64. The Trapping of Electrons in Silver Chloride. J. R. Haynes and W. Shockley. "Report of a Conference on Strength of Solids," *The Physical Society,* 1948, p. 151-157.

Role of electrons in certain photographic processes. New techniques developed for the study of motion and trapping of electrons in crystals. A large number of electron traps are produced in the slip bands of deformed crystals.

11-65. Etude micrographique de l'oxydation du fer et des transformations du protoxyde de fer. (Micrographic Study of the Oxidation of Iron and of the Transformations of Ferrous Oxide.) Georges Chaudron. "Pittsburgh International Conference on Surface Reactions", 1948, p. 165-167.

Simple micrographic technique will give very precise information concerning these reaction mechanisms.

11-66. Detection of Ferrite by its Magnetism. T. V. Simpkinson and M. J. Lavigne. *Metal Progress,* v. 55, Feb. 1949, p. 164-167.

Many of the obscure troubles now and then experienced by stainless steels of the 18-8 family are ascribed to changes in microstructure. Detection of ferrite in duplex structures is difficult and likely to be erroneous if only the microscope is used. Measurement of residual magnetism is a sensitive detector of ferrite; although, when sigma phase co-exists, the magnetic and microscopic estimate may differ considerably.

11-67. Rapid Polish With Diamond Hand Hone. L. P. Tarasov and C. O. Lundberg. *Metal Progress,* v. 55, Feb. 1949, p. 183-184.

The intermediate stages in the polishing of metallographic specimens may be greatly speeded up by the use of a vitrified-bonded diamond hand hone. Technique can be used to polish high speed steels of the high-carbon, high-vanadium type which are difficult or impossible to polish by ordinary methods.

11-68. A Method of Examination of Sections of Fine Metal Powder Particles With the Electron Microscope. Laurence Delisle. *Journal of Metals,* v. 1, sec. 3, Mar. 1949, p. 228-232.

Application of a technique to the study of sections of metal-powder particles, less than 20 microns in diam., with the electron microscope using as replica a material such as formvar or parlodion.

11-69. Mounting Metallographic Specimens at Room Temperature. Herbert S. Kalish. *Iron Age,* v. 163, Mar. 10, 1949, p. 109.

Technique developed for examining low-melting-point metals or alloys, soft metals, metals which recrystallize at low temperatures, and alloys which age harden at room temperature or change structurally at temperatures slightly above room temperature. Polystyrene is the material used.

11-70. An Apparatus for the Production of Large Metallic Crystals by Solidification at High Temperatures. Louis Gold. *Review of Scientific Instruments,* v. 20, Feb. 1949, p. 115-121.

Design and operational aspects. Various high-temperature difficulties. 26 ref.

11-71. The Use of Addition Agents in Etchants for Special Effects. I. R. Lamborn. *Steel Processing,* v. 35, Feb. 1949, p. 86-88; discussion, p. 88-89.

A survey.

11-72. The X-Ray Microscope. Paul Kirkpatrick. *Scientific American,* v. 180, Mar. 1949, p. 44-47.

Such a microscope does not exist, but its fundamental problem has been solved. When a practical model has been built, some doors closed to electrons and light will be opened.

11-73. Crystal Setting by X-Rays. J. W. Jeffery. *Journal of Scientific Instruments and of Physics in Industry,* v. 26, Feb. 1949, p. 42-43.

Practical steps of an X-ray setting method which can be used to calculate goniometer arc adjustments for a crystal which fails to give a recognizable zero-layer curve when misset.

11-74. Porosity in Metal Coatings. Formation and Assessment: Note on Work in Progress at B.I.S.R.A. J. Pearson. *Electroplating and Metal Finishing,* v. 2, Feb. 1949, p. 102-106.

Causes of porosity, pore-counting methods, methods for determining pore area, and relationship of pore count to weight of tinplate coatings. A new method for determination of porosity by cathodic suppression of solution.

11-75. A Third Graphical Method of Indexing Powder Photographs of Long-Spacing Compounds. (In English.) Vladimir Vand. *Acta Crystallographica,* v. 1, Dec. 1948, p. 290-291.

Method suitable for compounds with identifiable long-spacing reflections.

11-76. Secondary Extinction and Neutron Crystallography. (In English.) G. E. Bacon and R. D. Lowde. *Acta Crystallographica,* v. 1, Dec. 1948, p. 303-314.

Effects of secondary extinction with particular stress on the behavior of the virtually non-absorbing crystals introduced by neutron diffraction. Penetration of a beam into crystal of this kind will always be complete, and the relative importance of absorption and extinction is the reverse of that familiar in X-ray techniques. Criteria for "thin," "thick", "non-absorbing" and "absorbing" crystals are given.

11-77. The Measurement of Small Differences Between Lattice Spacings of Two Solid Solutions. (In English.) E. G. Steward. *Acta Crystallographica,* v. 1, Dec. 1948, p. 339.

Modified technique.

11-78. Calculation of the Magnetic Skin Effect in Sheet Steel With Re-

spect to the Relationship of Magnetic Permeability to Voltage of the Magnetic Field. (In Russian.) S. D. Margolin. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 18, Oct. 1948, p. 1306-1316.

A method for sufficiently accurate determination of the distribution of voltage of the magnetic field and magnetic induction through the thickness of a sheet, located in an alternating field, taking into consideration the skin effect and the relationship of magnetic permeability and voltage of the magnetic field.

11-79. A High Temperature Precision X-Ray Camera. Some Measurements of the Thermal Coefficients of Expansion of Beryllium. Paul Gordon. *U. S. Atomic Energy Commission,* AECD-2426, Oct. 1, 1948, 15 pages.

Modification of the back-reflection symmetrical focusing type of camera. Specimen and furnace are within a vacuum chamber. Lattice parameters of beryllium were measured up to 1000° C. Derived coefficients of thermal expansion, both linear and bulk, are presented as a function of temperature. The data present strong evidence that the hexagonal close-packed form of Be which exists at room temperature is stable up to at least 1000° C., contrary to several reports in the literature.

11-80. Sur la détermination expérimentale de la perte spécifique d'énergie des corps solides par la méthode des pendules couplés. (Experimental Determination of the Loss of Specific Energy of Solids by the Method of Coupled Pendulums.) André Kovacs. *Comptes Rendus* (France), v. 227, Nov. 15, 1948, p. 1019-1020.

Formulas for the calculation. Advantages, from viewpoint of simplicity and accuracy.

11-81. Nouveau Microscope polarisant fonctionnant en lumiere convergente jusqu'a la température de −150 environ. (A New Polarizing Microscope Operating With Convergent Light at Temperatures as Low as −150° C.) Léon Bouttier. *Comptes Rendus* (France), v. 227, Nov. 22, 1948, p. 1084-1086.

The principal difference from the usual metallographic microscope consists of use of a refrigerating unit.

11-82. La structure et l'oxydation des surfaces d'aluminium polies électrolytiquement. (Structure and Oxidation of Electropolished Aluminum Surfaces.) Heinz Raether. *Comptes Rendus* (France), v. 227, Dec. 8, 1948, p. 1247-1249.

Aluminum specimens polished by Jacquet's method (perchloric acid—acetic anhydride) were investigated. Results demonstrate that the electrolytic bath removes only the aluminum without changing the microgeometry of the surface and its atomic dimensions.

11-83. Le microscope électronique et son emploi pour l'étude des états de surfaces. (The Electron Microscope and Its Use for Study of Surface Conditions.) Gaston Dupouy. *Journées des Etats de Surface,* 1946, p. 15-32.

See abstract from *Metal Treatment.* Item 11-110, 1946.

11-84. Etude des surfaces métalliques par voie électrolytique. Role de la couche de Beilby. (Study of Metallic Surfaces by an Electrolytic Method. Role of the Beilby Layer.) M. A. Grumbach. *Journées des Etats de Surface,* 1946, p. 37-39.

How Well Informed Are You?

See Quiz on Page 4

Reviews the above from 1912 to date.

11-85. L'oxydation anodique envisagée comme moyen d'étude de l'état de surface de l'aluminium et de ses alliages. (Anodic Oxidation As a Means of Studying the Surface State of Aluminum and Its Alloys.) P. Lacombe and L. Beaujard. *Journées des Etats de Surface,* 1946, p. 44-51; discussion, p. 51.

See abstract from *Metal Treatment,* item 11-20, 1946.

11-86. L'écrouissage superficiel de l'Aluminium et du Fer, par abrasion. Emploi des rayons X en retour pour l'étude des états de surface. (Superficial Strain Hardening of Aluminum and Iron by Means of Abrasion. Application of X-Ray Diffraction for the Study of Surface States.) J. Benard, S. P. Lacombe, and G. Chaudron. *Journées des Etats de Surface,* 1946, p. 73-80; discussion, p. 81.

A method for inspection of hardened surfaces by means of X-ray diffraction. Optimum conditions of investigation and a series of x-ray diagrams.

11-87. Quelques problemes relatifs a la conception des instruments pour l'étude des surfaces. (Some Problems Relative to the Development of Instruments for the Study of Surfaces.) R. E. Reason. *Journées des Etats de Surface,* 1946, p. 100-103; discussion, p. 103.

See abstract from *Institution of Mechanical Engineers, Proceedings,* item 11-50, 1946.

11-88. Généralités sur les méthodes optiques d'examen des surfaces. Méthodes mises en oeuvre a l'institut d'optique. (General Discussion of Optical Methods for Examination of Surfaces. Methods Used in the Optical Institute of France.) M. A. Arnulf. *Journées des Etats de Surface,* 1946, p. 104-109.

Various pieces of equipment.

11-89. Détermination des profils de rugosité par les méthodes de pointes longitudinaux et par interférences. (Determination of Surface Roughness by Use of Longitudinal Feelers and by Interference Techniques.) F. Flamant and M. A. Arnulf. *Journées des Etats de Surface,* 1946, p. 110-116; discussion, p. 116.

Application of individual methods to different surfaces, after simple machining, grinding, mechanical or electrolytic polishing.

11-90. Vue d'ensemble sur les récents travaux concernant la mesure de la rugosité des surfaces. (Survey of Recent Work on Measurement of Surface Roughness.) C. Timms. *Journées des Etats de Surface,* 1946, p. 117-123.

See abstract from *Metal Treatment,* item 11-55, 1946.

11-91. Comparaison des principales méthodes de controle microgéométrique. (Comparison of the Most Important Methods for Surface-Finish Control.) G. Michalet. *Journées des Etats de Surface,* 1946, p. 124-134; discussion, p. 134.

Different methods and equipment used for the determination of the roughness of surface and degree of polishing. Schematic drawings of equipment; methods of their application. 17 ref.

11-92. Suggestions concernant l'emploi du correlogramme pour l'interprétation des enregistrements du fini de surface. (Suggestions Concerning Use of Correlation Charts for Interpretation of Surface-Finish Records.) J. R. Womersley and M. R. Hopkins. *Journées des Etats de Surface,* 1946, p. 135-139; discussion, p. 139.

The profilogram obtained by an apparatus with feelers does not define completely the condition of the surface. The true surface condition may be determined only by meticulous analysis of a series of profilograms compiled into a correlation chart.

11-93. Etude optique de l'état de surfaces sablées et création de tests. (Optical Study of the Condition of Sand-Blasted Surfaces and the Methods for Their Testing.) F. Canac. *Journées des Etats de Surface,* 1946, p. 149-152; discussion, p. 152.

Test apparatus is described and method of interpretation of the results.

11-94. Relation entre le coefficient de frottement et l'état de surface. (Relation Between the Coefficient of Friction and Surface Conditions.) A. Marcelin. *Journées des Etats de Surface,* 1946, p. 179-184; discussion, p. 185-186

A newly developed apparatus called the "frictionograph". Method of application and interpretation of obtained data.

11-95. Etude de l'état de surface chimique de l'Aluminium par la mesure du potentiel de dissolution. (Study of the Chemical State of an Aluminum Surface by Measurement of Solution Potential.) P. Morize, P. Lacombe, and G. Chaudron. *Journées des Etats de Surface,* 1946, p. 242-246; discussion, p. 246.

Previously abstracted from translation in *British Chemical Digest.* See item 11-159, 1947.

11-96. Fractographic Examination of Ship Plate. C. A. Zapffe, C. O. Worden, and F. K. Landgraf. *Welding Journal,* v. 28, Mar. 1949, p. 126s-135s.

Application to the problem of classifying ship steels in terms of toughness and transition temperatures. Excellent agreement of predictions of fractography with mechanical testing. Effects of alloying elements, hydrogen, and heat treatments. 13 ref.

11-97. A Rapid Method for Preparing Powder Camera Specimens With Cellulose Acetate Capillary Tubes. Karl E. Beu and Howard H. Claassen. *Review of Scientific Instruments,* v. 19, Mar. 1948, p. 179-180.

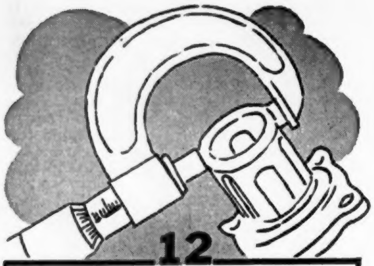
Details which facilitate the synthesis of such tubes and their subsequent removal from the pilot wire. Wires of 22-gage copper, after annealing in an atmosphere of helium, are cleaned and dipped into the cellulose acetate solution by means of a crank-driven rack. The rate of withdrawal determines the wall thickness. A method for centering the filled specimen tubes precisely in the powder camera.

11-98. Un nuovo apparecchio generatore di raggi-X di grande lunghezza d'onda, per usi metallurgici. (A New Long-Wave-Length X-Ray Apparatus for Metallurgical Research.) A. Gilardoni. *Alluminio,* v. 17, Nov.-Dec. 1948, p. 576-580.

Describes apparatus with wave lengths of 0.6-0.17A, particularly adaptable for industrial research, construction and specifications.

11-99. Contemporary Feeler Equipment for Quantitative Determination of Surface Roughness. (In Russian.) P. E. D'yachenko. *Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk* (Bulletin of the Academy of Sciences of the USSR, Section of Technical Sciences), Oct. 1948, p. 1627-1633.

Existing methods and apparatus. Comparative results.



INSPECTION and STANDARDIZATION

12-38. Gauging of Precision Screw Threads—Internal Threads. A. C. Pruliere. *Microtecnic* (English Edition), v. 11, Dec. 1948, p. 234-240. Translated from the French.

General principles. Procedures and equipment.

12-39. Workpiece Inspection in Modern Mass Production. H. Kieffer. *Microtecnic* (English Edition), v. 11, Dec. 1948, p. 263-266. Translated from the French.

Recommended methods and inspection devices.

12-40. The Mu-Adjustable Cylindrical Plug Gauge. Carl Weiland. *Microtecnic* (English Edition), v. 11, Dec. 1948, p. 275-276. Translated from the German.

Gage for measuring internal diameters.

12-41. Central Inspection Department Solves Daily Production Problems at Hunter Spring. *Steel,* v. 124, Feb. 21, 1949, p. 123-124.

12-42. Rotary Files and Burs. *American Machinist,* v. 93, Feb. 24, 1949, p. 129, 131.

Standard types and standard dimensions.

12-43. Transition Problems in Producing the Unified Screw Thread. William Boyd. *Iron Age,* v. 163, Feb. 24, 1949, p. 66-71.

Conversion is expected to cost the industry about $3 million and take up to 5 yrs. Changes in production facilities and gaging and inspection; do's and don't's in making the change; and the new fits.

12-44. Law of Failure of Stresscoat. A. J. Durelli and T. N. DeWolf. *Proceedings of the Society for Experimental Stress Analysis,* v. 6, No. 2, 1948, p. 68-83.

In interpreting results of brittle coating experiments, it is generally accepted that Stresscoat breaks when the maximum tensile strain exceeds a critical value. Demonstrates two extreme cases: singular point and pure compression, where this law does not apply. Five particular cases were studied experimentally.

12-45. "H" Steels; Chemical Composition Ranges. *Metal Progress,* v. 55, Feb. 1949, p. 184B.

A tabulation.

12-46. Weld Testing by Ultrasonic Methods. G. Konried and A. C. Rankin. *Welding,* v. 17, Feb. 1949, p. 48-57.

Comparative study of different techniques.

12-47. Checking Thread Pitch Diameter Runout. *Iron Age,* v. 163, Mar. 3, 1949, p. 95.

Simple but quite effective method of checking the above.

12-48. A New, Fast Method of Inspecting Airfoil Contours of Blades. Edward C. Polidor. *Machine and Tool Blue Book,* v. 45, Mar. 1949, p. 111-117.

New "Pant-O-Scriber" blade-checking machine designed as a fast, economical method of checking blades, forging dies, master patterns, and cast or forged blades.

12-49. Statistical Methods Double Quality Control Efficiency. S. E. Peters. *Factory Management and Maintenance,* v. 107, Mar. 1949, p. 84-86.

Use by Dunmore Co., Racine, Wis.

12-50. How Steel Producers View Steel Compositions and Specifications. Charles M. Parker. *Steel,* v. 124, Mar. 14, 1949, p. 91-96, 98.

Improperly used words such as "quality," "grade," "type," and "kind" are sometimes the cause of additional unnecessary expense. Definitions of terms; influence of current raw materials problems on steel compositions; six common methods of specifying steels.

12-51. Operation of Statistical Quality Control in a Steel Mill. W. T. Rogers. *Steel,* v. 124, Mar. 14, 1949, p. 102, 105, 108, 111, 114, 117, 120, 122.

Statistical methods used and illustration of each.

12-52. Etat actuel de la normalisation et des méthodes de controle des états de surface en suede. (Present Position of Standardization and Methods for Control of Surface Condition in Sweden.) Karl Wessel. *Journées des Etats de Surface,* 1946, p. 144-148; discussion, p. 148.

12-53. Inspection Moves Ahead. William A. Ormondroyd. *Tool Engineer,* v. 22, Mar. 1949, p. 35-36.

Recent equipment developments.

12-54. The Supersonic Reflectoscope. Ralph H. Frank and Robert W. Renner. *Proceedings of the National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 31, 1948, p. 299-304; discussion, p. 304-306.

Applications in the testing of steel.

12-55. Electronic Gauges. (Continued.) Jean Schwartz. *Microtecnic* (English Edition), v. 11, Dec. 1948, p. 267-274. Translated from the French.

Description and methods of use. Begins descriptions of some complete measuring systems. (To be continued.)

12-56. Die Verwendung von Bleifiltern bei der Röntgendurchstrahlung von Stahl mit Röhrenspannungen von 100 bis 220 kv. (The Use of Lead Filters for X-Ray Investigation of Steel With Tube Voltages of 100 to 220 KV.) Ernst A. W. Muller. *Stahl und Eisen,* v. 68, July 15, 1948, p. 277.

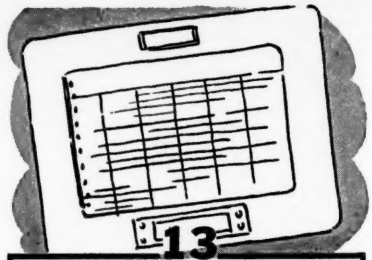
Customary X-ray diagrams are subject to error in that they fail to account for the thickness of the material. This defect is corrected by lead filters. Relation of the steel thickness to filter thickness.

12-57. (Book.) **A.S.T.M. Specifications for Steel Piping Materials.** 319 pages. Dec. 1948. American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa.

Covers pipe, tubes, castings, forgings, and bolting.

For additional annotations indexed in other sections, see:

3B-31; 8-65



TEMPERATURE MEASUREMENT and CONTROL

13-18. The ABC's of Multi-Element Control. Clayton H. Barnard. *Instruments,* v. 22, Feb. 1949, p. 179-181.

Multi-element temperature control is clarified by text and simple diagrams.

13-19. Precision of Heat Transfer Measurements With Thermocouples—Insulation Error. W. A. Mohun. *Canadian Journal of Research,* v. 26, sec. F, Dec. 1948, p. 565-583.

Method for calculating temperature variation in insulated thermocouple lead wires. The difference between the junction temperature and that of the surrounding material is called "insulation error." This error is determined by variations in the temperature of the path followed by the lead wires only over a limited distance from the junction, called the "critical distance." Hence, to eliminate insulation error, the path need be isothermal only for this distance.

13-20. Industrial High-Speed Infrared Pyrometer. W. S. Gorrill. *Electronics,* v. 22, Mar. 1949, p. 112-114.

Accurate measurement of the temperatures of tin cans moving at high speeds by the use of infrared pyrometry. Proper adjustment of heating flames and cooling air is maintained by measuring the temperature of the soldered seams as the cans pass from one operation to the next at normal operating speeds.

13-21. A Bath Immersion Pyrometer. P. M. Johnson. *Proceedings of the National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 31, 1948, p. 250-252; discussion, p. 252-254.

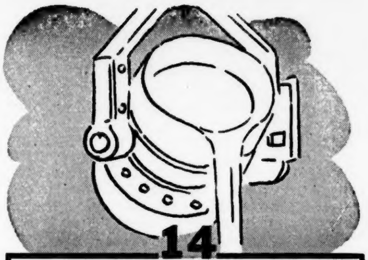
Construction and use. Errors in use.

13-22. "Heat Inertia" in Problems of Automatic Control of Temperature. Victor Broida. *Instruments,* v. 22, Feb. 1949, p. 136-138, 160-164, 166.

A new calculation method for solving practical process-control problems in a wide variety of fields is based on the concept of the "fictitious mass" of a heat-process unit under automatic control. (To be continued.)

13-23. A Versatile High-Speed Temperature Recorder. T. W. Kethley and W. B. Cown. *Research Engineer* (Georgia Institute of Technology), Mar. 1949, p. 5-6, 22-24.

System for high-speed recording of thermocouple temperatures over a wide range using inexpensive commercially available equipment. It is capable of recording temperature ranges as small as 1° F. or as great as 1000° F.; it has a sensitivity of about 1%, and it can record temperature changes at chart speeds as high as 0.2 in. per sec. or as low as 0.75 in. per hr.



FOUNDRY PRACTICE

14A—General

14A-22. Core Drying; Suitability and Efficiency of High Frequency Heating. F. Bird and J. Pound. *Metal Industry,* v. 74, Feb. 4, 1949, p. 83-85.

14A-23. Better Patching Improves Cupola Operation. Tom Barlow and E. W. Claar. *Foundry,* v. 77, Mar. 1949, p. 68-69, 254, 256, 258, 260.

Recommended procedures for greater uniformity and improved results.

14A-24. Thermoplastic Patterns. Thomas A. Dickinson. *Foundry,* v. 77, Mar. 1949, p. 160-162, 164.

Use of Plasticarve, a typical low-melting compound used in modeling or duplicating patterns.

14A-25. Investment Materials for Industrial Precision Casting. Thomas E. Moore. *Foundry,* v. 77, Mar. 1949, p. 196.

Properties and applications of low and high-temperature investment casting materials.

14A-26. Symposium on Foundry Dust Control. *American Foundrymen's Association,* June 1947, 24 pages.

Introduction and six papers on dust-control equipment and its maintenance.

14A-27. Shot Blasting; New Design of Airless Rotary Barrel Machine. *Iron and Steel,* v. 22, Feb. 1949, p. 58.

In this equipment for cleaning castings, no compressed air is used, the shot being projected upon the work by a high-speed impeller.

14A-28. Risering Castings. J. B. Caine. *American Foundryman,* v. 15, Mar. 1949, p. 46-55.

Scientific approach to the problem of gating and risering. Risering is divided into two phases, positioning and dimensioning. A basic risering system is proposed for positioning risers. Quantitative information derived from this system for any metal can be applied to any casting, no matter how complex. An equation for dimensioning risers. Numerical values of the constants for steel. 10 ref.

14A-29. Rapid Sand Permeability Calculation. D. S. Eppelsheimer and J. E. Reynolds. *American Foundryman,* v. 15, Mar. 1949, p. 56-57.

Presents nomograph and illustrates its use by application to the extreme cases of zero and infinite permeability.

14A-30. Modern Foundry Methods: Mixing-Applying Mold and Core Washes. *American Foundryman,* v. 15, Mar. 1949, p. 58-60. Based on paper by Robert B. Melmoth.

Methods used in a production foundry.

14A-31. Densified Wood Applied to Metal-Working Operations. *Machinery* (American), v. 55, Mar. 1949, p. 185-187.

Densified wood is wood impregnated with phenolic resin. Uses for patterns and molds; methods for machining and drilling the materials.

14A-32. Precision Casting With Frozen Mercury Patterns: The Mercast Process. Wm. I. Neimeyer. *Iron Age,* v. 163, Mar. 17, 1949, p. 94-97.

Castings weighing up to 60 lb., with tolerances of ±0.0015 in. per in., are now being produced by a process which makes use of frozen mercury for the pattern and a fired ceramic shell-like material for the mold.

14A-33. New Precision Casting Process Provides Better Finish, Closer Tolerances. Herbert Chase and Leslie T. Schakenbach. *Materials & Methods,* v. 29, Mar. 1949, p. 52-56.

"Mercast" process used by Sperry Gyroscope Co.—a variation of precision casting in which frozen mercury replaces the wax most generally used in investment casting. Highly accurate aluminum and stainless steel precision castings are thus produced.

14A-34. Einfluss von Kohlenstaubzusätzen zum Formsand (NE-Guss). (The Effect of Coal Dust in Molding Sand (NE-Casting).) Edmund T. Richards. *Die Neue Giesserei,* v. 33-35 (new ser., v. 1), Nov. 1948, p. 147-148.

Desirable effects of hard-coal dust and sawdust in molding sand on appearance and quality on the basis of moisture content, compressive strength, and gas permeability of molds containing these ingredients.

14A-35. Kernbinder, ihre Natur, Anwendung und Ueberwachung. (Core Binders; Their Nature, Use, and Control.) Wilhelm Werner Magers. *Die Neue Giesserei,* v. 36 (new ser., v. 2), Jan. 1949, p. 10-13.

Core oils, core emulsions, dry binders, wet binders, synthetic resin binders (Croning process), the lost-wax process, and methods of testing core binders for proper control.

14A-36. Konstruktions- und Modellgestaltung. (Pattern Design and Construction.) J. Hagen. *Die Neue Giesserei,* v. 36 (new ser., v. 2), Jan. 1949, p. 14-19.

The importance of considering basic physical laws in the design of castings and the importance of close cooperation between the designer and the foundryman to reduce rejects and pattern costs.

14A-37. Sable synthétique. (Synthetic Sand.) Gabriel Joly. *Fonderie,* Dec. 1948, p. 1417-1419.

Use of synthetic molding sand consisting of silica sand and colloidal clay in amounts varying between 3 and 8% (depending on the quality of the clay). Advantages and method of production.

14A-38. (Book.) **Die-Casting Machines.** Rev. ed. 52 pages. Machinery Publishing Co., Ltd., National House, West St., Brighton 1, England. 3s., 6d.

Features of the modern die-casting machine in its various types and modifications, including goose-neck machines, both plunger and air operated, cold-chamber machines, and machines for special purposes. Short history of the early development of the die-casting machine.

14B—Ferrous

14B-23. Cupola Operations Today. *Canadian Metals and Metallurgical Industries,* v. 12, Feb. 1949, p. 41. Based on address by J. Hughes.

Cupola refractories, operation, and charge calculation.

14B-24. Magnesium Treatment for Nodular Graphite Cast Iron. *Iron Age,* v. 163, Feb. 24, 1949, p. 97-99.

The processing of nodular graphite cast iron. Influence of various Mg containing additions on physical properties. Precautions to be observed in conducting the Mg treatment from the standpoint of safety and optimum properties.

14B-25. Malleable Iron Foundry Brought up to Date. *Foundry,* v. 77, Mar. 1949, p. 76-79, 198.

Modernized and mechanized foundry of National Malleable & Steel Castings Co., Indianapolis.

14B-26. Patterns and Molding Methods for Steel Castings. John Howe Hall. *Foundry,* v. 77, Mar. 1949, p. 92-97, 260-262.

Use of various types of sweeps to form the mold cavity. (5th and concluding article.)

14B-27. New Gray Iron Foundry Replaces 60-Year Old Unit. *Foundry,* v. 77, Mar. 1949, p. 244, 246, 248.

Modernized foundry of Huber Mfg. Co., manufacturer of road-building and maintenance equipment.

14B-28. Steel Foundry Research. Tom Bishop and K. G. Lewis. *Foundry Trade Journal,* v. 86, Feb. 10, 1949, p. 111-117.

Work being conducted at Sheffield University in England includes improved fluidity-test procedure and equipment; micrographic study of the sand-metal interfaces; apparatus for determination of hot-tearing susceptibility; study of various molding sands and bonding agents; treatment and inspection of castings; and other phases.

14B-29. More Curious Wasters; Their Cause and Cure. *Iron and Steel,* v. 22, Feb. 1949, p. 38.

Unusual defective castings occasionally encountered in the foundry. Examples of scrapped ferrous castings which necessitated considerable investigation before the reason for failure was established.

14B-30. German Foundry Practice; Interrogation of Dr. Lanzendorfer. *Iron and Steel,* v. 22, Feb. 1949, p. 53-54. Based on BIOS Final Report No. 1802.

The practice described is that followed at Deutsche Einsenwerke, Mulheim, for ferrous metals.

14B-31. Shrinkage Cavities; Their Elimination by the Quasi-Bessemerizing Process. W. S. Williams. *Iron and Steel,* v. 22, Feb. 1949, p. 55.

Patented British process. Cavities can be practically eliminated by reducing the size of the feeder-head necks from 10 in. to 3 in. for even very heavy castings. Feeding of hot metal is automatic, it being kept fluid by combustion of a small quantity of silicon and carbon. The main object of the process is the refining of the iron in the body of the casting, and particularly in the vicinity of the blowing head.

14B-32. Automatische luchtgewichtregeling voor koepelovens. (Automatic Blast Control in the Cupola.) C. G. Dalhuysen. *Metalen,* v. 3, Jan. 1949, p. 107-110.

A newly developed method. Theoretical bases and structural details of the apparatus.

14B-33. Neue Erkenntnisse im Kupolöfenschmelzbetrieb. (New Facts on Melting in the Cupola Furnace.) August Kentischer. *Die Neue Giesserei,* v. 33-35 (new ser., v. 1), Sept. 1948, p. 75-80.

In the cupola furnace the iron is carburized almost exclusively above the combustion zone. The hearth, and the zones of combustion, reduction, melting, superheating, and carburization, and their respective effects on the melt.

14B-34. Eine Studie uber die Formmethoden zur Herstellung fehlerfreier Gussstucke. (A Study on Molding Practice for the Production of Flawless Castings.) C. Englisch. *Die Neue Giesserei,* v. 33-35 (new ser., v. 1), Sept. 1948, p. 83-85.

Recommended procedures.

14B-35. Das Schleudern von Stahlguss. (The Centrifuging of Cast Steel.) Georg Viktor Schmidt. *Die Neue Giesserei*, v. 33-35 (new ser., v. 1), Oct. 1948, p. 101-104.

Problems involved in the above using steel molds. A centrifuge and its parts are described. A successful method of centrifugal casting and of cleaning the finished castings.

14B-36. Die Herstellung von niedriggekohltem Temperguss im Konverter. (The Production of Low-Carbon Malleable Iron in the Converter.) Hermann Triebeler. *Die Neue Giesserei*, v. 33-35 (new ser., v. 1), Oct. 1948, p. 122-123.

14B-37. Sollen wir in Zementsand formen? (Should We Mold With "Cement Sand"?) Helmut Grolman. *Die Neue Giesserei*, v. 33-35 (new ser., v. 1), Oct. 1948, p. 123-124.

Proposes molds of cement sand (quartz sand, cement, and water in the ratio 85:10:5-6) for mass production of high-quality castings.

14B-38. Lunkerbildung und Erstarrungsvorgänge im Stahlguss. (Piping and Solidification Reactions in Steel Casting.) Hubert Juretzek. *Die Neue Giesserei*, v. 33-35 (new ser., v. 1), Nov. 1948, p. 139-146.

The problem of pipe formation and its prevention. 30 ref.

14B-39. Warmrissbildung in Stahlguss. (Hot Crack Formation in Steel Castings.) Hubert Juretzek. *Die Neue Giesserei*, v. 33-35 (new ser., v. 1), Dec. 1948, p. 172-174.

Effect of mold material and condition as well as the critical temperature range in which cracking occurs. Specific recommendations. 10 ref.

14C—Nonferrous

14C-13. Melting and Casting of Non-Ferrous Metals. G. L. Bailey and W. A. Baker. *Journal of the Institute of Metals*, v. 75, Jan. 1949, p. 285-310.

The requirements of good-quality castings for subsequent working; the more common defects in ingots, and the origin of these defects. The solidification process and the main features of gas-metal equilibria, including sources of dissolved gases and principles involved in methods of degassing. The various commonly used casting methods. Present knowledge of factors determining the structure of ingots. 29 ref.

14C-14. The Production of Refined-Copper Shapes. R. H. Waddington. *Journal of the Institute of Metals*, v. 75, Jan. 1949, p. 311-324.

The procedure used commercially for production of standard and special shapes of electrolytic tough-pitch high-conductivity copper. Operations preceding melting and casting. Effects of variations in cathode structure; control of the electrolyte; use of addition agents; pouring methods; mold materials; control and inspection methods; and machining operations.

14C-15. Melting and Casting Aluminum Bronze Ingots for Subsequent Working. A. J. Murphy and G. T. Callis. *Journal of the Institute of Metals*, v. 75, Jan. 1949, p. 325-338.

Decisive factors are the short freezing range and the tenacious film of oxide which forms on the molten metal. The oxide film gives rise to surface defects on ingots cast with turbulent pouring but it enables a surface of exceptionally good quality to be obtained when nonturbulent methods of casting are used.

14C-16. The Application of Flux Degassing to Commercially-Cast Phosphor Bronze. N. I. Bond-Williams. *Journal of the Institute of Metals*, v. 75, Jan. 1949, p. 339-352.

Application of the principles of good melting and casting practice reported in papers to the Institute of Metals and other societies. The particular application considered is to the melting and casting of phosphor bronze for subsequent cold rolling.

14C-17. The Melting and Casting of Brass. Maurice Cook and N. F. Fletcher. *Journal of the Institute of Metals*, v. 75, Jan. 1949, p. 353-372.

Most important features of brass-melting practices, especially those of metallurgical interest. The suitability of different types of melting units. Possible sources of contamination, means of minimizing metal loss due to oxidation, and the addition of other elements. Molds and mold treatments. 11 ref.

14C-18. The Melting and Casting of Nickel Silver at the Works of Messrs. Henry Wiggin and Co., Ltd. E. J. Bradbury and P. G. Turner. *Journal of the Institute of Metals*, v. 75, Jan. 1949, p. 373-390.

Equipment and procedures, including oil and coke-furnace crucible melting, and the special technique necessitated by the adoption of water-cooled molds for casting strip ingots.

14C-19. The "Soro" Method of Manufacturing Brass and Other Bars. *Machinery Lloyd* (Overseas Eidtion), v. 21, Jan. 29, 1949, p. 107-109.

Centrifugal-casting method is said to permit economical manufacture of bars even in small quantities. It is applicable to various nonferrous alloys.

14C-20. Modern Non-Ferrous Foundry of American Brake Shoe Co. (at Meadville, Pennsylvania) Replaces Four Old Plants. *Industrial Heating*, v. 16, Feb. 1949, p. 214-216, 218, 220, 222, 224, 226, 325-326, 328.

14C-21. Die-Casting Practice and Technique. V. Gravity or Pressure? W. M. Halliday. *Metal Industry*, v. 74, Feb. 4, 1949, p. 87-90.

Pros and cons of the two methods.

14C-22. New Nonferrous Foundry Incorporates Outstanding Working Conditions. William G. Gude. *Foundry*, v. 77, Mar. 1949, p. 70-75.

Equipment and procedures of Meadville, Pa., plant of National Bearing Div., American Brake Shoe Co.

14C-23. Use of Lithium Cartridges in Treating High-Conductivity Copper and Copper-Base Alloys. P. E. Landolt and F. R. Pyne. *Foundry*, v. 77, Mar. 1949, p. 90-91, 262,-263.

Use of cartridges consisting of a definite amount of metallic lithium hermetically sealed in copper tubing and available in three sizes. Their use avoids several disadvantages connected with use of pure Li metal or even Li master alloys.

14C-24. Die-Casting Practice and Technique. VII. Layout Drawing. W. M. Halliday. *Metal Industry*, v. 74, Feb. 25, 1949, p. 143-145; Mar. 4, 1949, p. 169-173.

Standard layout form; flash, sprues, runners, and spray produced from a two-cavity combination die. Die lubrication and gravity dies. Second installment: colored and detail drawings; checking; machining limitations; common deficiencies; dimensioning; and method of projection.

14C-25. Contract Production and Finishing of Die Castings. *Machinery* (London), v. 74, Feb. 24, 1949, p. 243-248.

Production of miscellaneous die castings by British firm.

14C-26. Zum Schmelzen und Giessen von Aluminium-bronzen. (The Melting and Casting of Aluminum Bronzes.) Edmund R. Thews. *Die Neue Giesserei*, v. 33-35 (new ser., v. 1), Oct. 1948, p. 110-116.

The properties of aluminum bronzes alloyed with Fe, Ni, Mn, Pb, and Si; the effect of scrap, special elements, fluxes, and oxidants; the method of melting and alloying, melting and pouring temperatures, mold materials, shrinkage, gates, risers, chill plates, moisture content and air-permeability of the molding sand, cooling, centrifugal and pressure casting. 10 ref.

14C-27. (Book.) **Moulds for Plastics.** W. M. Halliday. 259 pages. Temple Press, Ltd., Bowling Green Lane, London, E.C.1, England. 30s.

This textbook will be of value to those concerned with the design and production of die-casting dies, since so many of the practices in injection-mold design are common to those for die-casting dies. Contains detailed examination of coring, ejectors, sleeves, dowels, slides. (From review in *Die Castings*.)

14D—Light Metals

14D-14. Why Die Castings? R. F. Hauser. *Modern Metals*, v. 5, Feb. 1949, p. 18-21.

Advantages and limitations of die casting especially as applied to Al and Mg.

14D-15. Die Lubricants for Light Metal Die Casting. Eric James. *Light Metal Age*, v. 7, Feb. 1949, p. 12-13, 20, 27.

Correct selection and application of die lubricants for light-metal die casting.

14D-16. 2500-Lb. Aluminum Casting Produced in Britain. *Foundry*, v. 77, Mar. 1949, p. 136.

Method of production of a pulley to be used in connection with a drive for oil-field slush pumps.

14D-17. La coulée tranquille dans les moulages au sable des alliages légers. Incidences de la coulée en source dans l'alimentation des moules. (Static Casting of Light Alloys in Sand Molds. Effect of Bottom Casting on the Feeding of the Mold.) André Caillon. *Revue de l'Aluminium*, v. 26, Jan. 1949, p. 3-13.

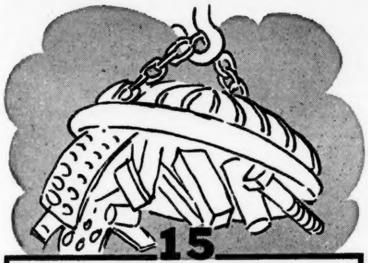
Basic principles. Advantages of such methods with respect to the quality of finished products. Optimum conditions and factors to be considered.

14D-18. (Book.) **Aluminum Alloy Castings.** Floyd A. Lewis. 64 pages. Aluminum Association, 420 Lexington Ave., New York 17, N. Y. 50c.

Reprints of 12 articles originally published in *Foundry* and two in *Steel*. Based upon a postwar survey sponsored by the foundry division of the Aluminum Association.

For additional annotations indexed in other sections, see:

3B-51-55; 4B-19; 16B-34-35; 17-12; 21B-14; 24C-1; 24D-2



15 SCRAP and BYPRODUCT UTILIZATION

15-16. Secondary Metals Increase in Importance. A. E. St. John. *Journal of Metals,* sec. 1, v. 1, Mar. 1949, p. 8-11.

Trend toward the above as virgin metal supplies become more scarce. Scrap metal collection and utilization procedures in basic nonferrous metals.

15-17. Scrap Metals. Charles White Merrill, Norwood B. Melcher, and A. J. McDermid. *Mining Congress Journal,* v. 35, Feb. 1949, p. 119-121.

Price, production, and consumption trends.

15-18. Treatment of Plating Wastes. E. G. Kominek. *Metal Finishing,* v. 47, Mar. 1949, p. 56-62.

Legal aspects and technical problems.

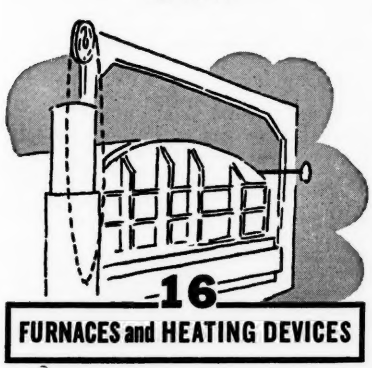
15-19. Problems in Supplying Scrap for Electric-Furnace Requirements. Stanley M. Kaplan. *Proceedings of the Electric Furnace Steel Conference, American Institute of Mining and Metallurgical Engineers,* v. 5, 1947, p. 94-96; discussion, p. 100-104.

Physical specification and chemical composition of quality scrap. Education of producers and collectors; maintaining supply and quality; temporary source.

15-20. The Outlook for Scrap. Edwin C. Barringer. *Proceedings of the Electric Furnace Steel Conference, American Institute of Mining and Metallurgical Engineers,* v. 5, 1947, p. 97-100; discussion, p. 100-104.

Ferrous scrap supply prospects from Dec. 1947 point of view.

For additional annotations indexed in other sections, see:
2B-59-87



16 FURNACES and HEATING DEVICES

16A—General

16A-18. Improved Annealing Furnace Operation by Use of Tempered Flame Burners. A. A. Fennell. *Industrial Heating,* v. 16, Feb. 1949, p. 240, 242, 244, 246, 248-250.

Car-type annealing furnace is equipped with special burners arranged to fire over and under the load, without flame impingement. A special design of burner is used which gives a luminous flame with 100% excess air. Nozzle prevents blowout even with 600% excess air.

16A-19. How Induction Heating Can Help Save Cold Cash. *Modern Industry,* v. 17, Feb. 15, 1949, p. 109-110.

16A-20. Economics of Radio Frequency Heating. A. P. Bock. *Industrial Heating,* v. 16, Feb. 1949, p. 230, 232, 234, 236, 238, 323-324; *Steel,* v. 124, Feb. 21, 1949, p. 94-97.

Graphs aid in calculating the above for specific jobs.

16A-21. Radiant Heat Drying of Industrial Paints. K. A. Lohausen. *Electroplating and Metal Finishing,* v. 2, Feb. 1949, p. 107-115. Translated from *Metalloberfläche,* v. 2, No. 12, 1948, p. 257-261.

Mechanism of radiant-heat drying and equipment. The influence of the paint, the base to which the paint is applied, and the type and intensity of radiation.

16A-22. Furnace Atmospheres—Their Generation and Use. William F. Barstow. *Steel Processing,* v. 35, Feb. 1949, p. 91-94, 96-97.

Various types of equipment and applications.

16A-23. Notes on Industrial Furnace Design. A. H. Holden. *Gas Times,* v. 58, Feb. 11, 1949, p. 170-173.

16A-24. How to Select Induction Heating Equipment. Frank T. Chesnut. *Steel,* v. 124, Mar. 21, 1949, p. 109-112, 116.

Recommendations for selection among the five distinct sources of current supply available.

16A-25. The Manifold Problem. J. D. Keller. *Journal of Applied Mechanics,* v. 16 *(Transactions of the American Society of Mechanical Engineers,* v. 71), Mar. 1949, p. 77-85.

The general problem of manifolds supplying fluids to a set of parallel pipes or ducts, or discharging through numerous openings along the manifold length. "Pipe burners" for gaseous fuels; the manifold of the "radiant-fire" type of gas burner; distributing flues above and below the checkers of openhearth furnaces; furnace combustion chambers containing heat ports; and many others.

16A-26. Fours électriques a haute fréquence de fusion et coulée en lingotiere sous vide. (High Frequency Electric Furnace for Melting and Casting in Vacuum.) *Journal du Four Electrique et des Industries Electrochimiques,* v. 57, Nov.-Dec. 1948, p. 123-126.

Principles of such furnaces and sphere of application.

16B—Ferrous

16B-21. Earthquake-Proof Blast Furnace Structure. *Iron Age,* v. 163, Mar. 10, 1949, p. 120.

Built for a Chilean company by a New York firm.

16B-22. A Combined Carburizing and Nitriding Furnace. II. J. Lomas. *British Steelmaker,* v. 15, Feb. 1949, p. 82-85.

Furnace made in the U. S.

16B-23. A New 170-Ton Open Hearth. E. Voet. *Iron and Steel Engineer,* v. 26, Feb. 1949, p. 112.

Furnace recently built in Holland includes several innovations not typical European practice.

16B-24. The Application of Dry-Coke Cooling Plants to Integrated Iron and Steel Works. L. H. W. Savage and A. V. Brancker. *Journal of the Iron and Steel Institute,* v. 161, Feb. 1949, p. 103-117.

The main points of difference between three types of dry-coke cooling plants and their influence on coke-oven operation. Cost estimates for a series of conditions. The influence of dry cooling on size and quality of the coke, and effect of the plant on the fuel and power balance of an integrated works.

16B-25. Fundamental Electric Terms. A. R. Oltrogge. *Proceedings of the Electric Furnace Steel Conference, American Institute of Mining and Metallurgical Engineers,* v. 5, 1947, p. 261-267.

Problems of getting the most from an arc-furnace electric circuit.

16B-26. Operation of the Panel Board of an Electric Furnace. Frank W. Cramer. *Proceedings of the Electric Furnace Steel Conference, American Institute of Mining and Metallurgical Engineers,* v. 5, 1947, p. 267-280.

Special reference to functions of meters and control equipment.

16B-27. Review of Furnace Maintenance. Murray J. Miller. *Proceedings of the National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 31, 1948, p. 60-61; discussion, p. 62-65.

Bottoms, banks, taphole, and flush-hole repairs. Tabulated data on out time by months from Republic Steel Corp.

16B-28. Increasing Firing Rates. H. S. Hall. *Proceedings of the National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 31, 1948, p. 66-68.

Methods for maximum heat transfer from flame to bath.

16B-29. Heating Open-Hearth Furnaces. John J. Hazel. *Proceedings of the National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 31, 1948, p. 156-157; discussion, p. 157-159.

Value of controlled heating.

16B-30. Modern vs. Old-Type Soaking Pits for Steel Ingots. F. N. Hays. *Proceedings of the National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 31, 1948, p. 255-262; discussion, p. 262-265.

Heat distribution, combustion space, temperature control, and overcharging. The modern soaking pit.

16B-31. Beziehungen zwischen der spezifischen Leistung von Hochöfen und ihrem Koksverbrauch. (Relation Between the Specific Efficiency of Blast Furnaces and Their Coke Consumption.) Fritz Wesemann. *Stahl und Eisen,* v. 68, Jan. 1, 1948, p. 1-8.

A critical evaluation of statistical data and a study of measures designed to reduce the consumption of coke in the smelting of iron.

16B-32. Herstellung von Ferrolegierungen im Elektroöfen und Folgerungen fur den Stahlwerker. (The Production of Ferroalloys in the Electric Furnace and Instructions to the Steel Worker.) Harro Werwach. *Stahl und Eisen,* v. 68, Jan. 1, 1948, p. 8-14.

The efficient melting of eight different ferroalloys, giving recommendations for saving electricity. The principal features of a ferrosilicon furnace.

16B-33. Breite der ringförmigen Verbrennungszone bei neueren nordamerikanischen Hochöfen. (Width of the Annular Combustion Zone of Modern North American Blast Furnaces.) Ernst Krebs. *Stahl und Eisen,* v. 68, June 17, 1948, p. 235-236.

A mathematical correlation of the area of the combustion zone to the rate of coke consumption and the diameter of the hearth.

16B-34. Neuere Erfahrungen mit Heisswindkupolöfen. (Recent Experiences With Hot-Blast Cupola Furnaces.) Karl Roesch. *Die Neue Giesserei,* v. 33-35 (new ser., v. 1), Dec. 1948, p. 165-169.

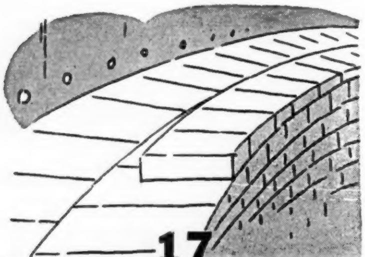
Development, principles, and mechanism. Advantages and disadvantages. 11 ref.

16B-35. Die Wirkung des Heisswindes auf die Verbrennungsvorgänge im Kupolöfen. (The Effect of the Hot Blast on Combustion in the Cupola Furnace.) Otto Gunthner. *Die Neue Giesserei,* v. 33-35 (new ser., v. 1), Dec. 1948, p. 169-171.

A critical evaluation; operating principles.

For additional annotations indexed in other sections, see:

2B-36-37-39; 2D-10-11-12; 17-19; 19A-58



REFRACTORIES and FURNACE MATERIALS

17-11. Properties and Uses of Pure Oxide Heavy Refractories. O. J. Whittemore, Jr. *Journal of the American Ceramic Society,* v. 32, Feb. 1, 1949, p. 48-53.

See abstract from *Materials & Methods,* item 17-100, 1948.

17-12. Olivine; Possible Alternative Material for Foundry Work. *Iron and Steel,* v. 22, Feb. 1949, p. 44.

Use of ferromagnesium silicate as a refractory and as a substitute for silica sand. Its great virtue is that it does not cause silicosis.

17-13. A Review of the Effects of Refractories on Cleanliness of Steel. Joseph G. Mravec. *Proceedings of the Electric Furnace Steel Conference, American Institute of Mining and Metallurgical Engineers,* v. 5, 1947, p. 22-28; discussion, p. 28-31.

Identification and distribution of refractory inclusions, evaluation of cleanliness, furnace runners, ladle lining, stopper-rod assembly, nozzles, hot tops, mold plugs, and pouring-pit practice.

17-14. Properties and Performances of Open Hearth Bottoms. Hobart N. Kraner. *Industrial Heating,* v. 16, Feb. 1949, p. 316, 318, 320-321. A condensation.

Problems involved in selection of proper materials. Desirable proportions of magnesia, dolomite, silica, and slag; advantages of using magnesite brick despite somewhat higher cost; detailed discussion of the economics of bad-bottom delay time vs. installation of new bottom. (To be continued.)

17-15. Standard Roof Life of Open Hearths. H. M. Kraner. *Proceedings of the National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 31, 1948, p. 159-160; discussion, p. 160-161.

Includes table which gives comparative data on life of roofs made of different refractories.

17-16. Pouring-Pit Refractories; Trends in Quality. L. A. Smith. *Proceedings of the National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 31, 1948, p. 161.

Trends in nozzles.

17-17. Standardization of Top Sleeves. W. S. Debenham. *Proceedings of the National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 31, 1948, p. 162-163; discussion, p. 163-164.

Preview of standards which were approved by the Manufacturing Problems Committee.

17-18. Construction of Basic End and Main Roof for Open-Hearth Furnaces. A. K. Moore. *Proceedings of the National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 31, 1948, p. 164-174; discussion, p. 174-180.

Use of chemically bonded brick, both plated and unplated. Five essential requirements.

17-19. Tests Ceramic Taphole Segment Against Blast Furnace Breakouts. *Steel,* v. 124, Mar. 21, 1949, p. 120, 122.

Proceedings of Chicago District Blast Furnace and Coke Association. Includes pressurized furnace operation; cleaning of coking coal; new coal-blending procedure; Labrador iron-ore deposits.

17-20. Pure Refractory Materials. F. H. Norton. *U. S. Atomic Energy Commission,* AECD-2237, Aug. 25, 1948, 3 pages.

Flow sheet for preparation of CeS, which melts at 2450° C. Comparative thermodynamic properties of a series of stable sulfides, all of which have lower melting points than CeS.

17-21. Investigation of Ceramic, Graphite, and Chrome-Plated Graphite Nozzles on Rocket Engine. George R. Kinney and William G. Lidman. *National Advisory Committee for Aeronautics,* Research Memorandum E8L16, Mar. 7, 1949, 17 pages.

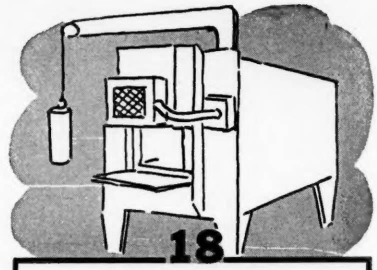
Use of ceramic material for rocket nozzles; effectiveness in preventing oxidation and erosion of graphite nozzles by chromium-plating the internal surface. Estimated combustion-gas temperatures were 2000-2400° F.

17-22. (Book.) **Manual of ASTM Standards on Refractory Materials.** 264 pages. American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. $2.50, paper cover; $3.15, clothbound.

Latest approved form of some 40 ASTM standard and tentative specifications, classifications, methods of testing, and definitions pertaining to refractories. Of the eight specifications, three cover malleable iron furnaces, fireclay, and castable refractories. Procedure for calculating heat losses; practice for use with ASTM panel spalling tests; petrographic techniques; data on standard samples for chemical analysis; pyrometric-cone equivalent determinations; and industrial surveys of service conditions of refractories are included.

For additional annotations indexed in other sections, see:

2B-39-56-57-58; 2D-11; 10A-50-51; 14A-23; 14B-23



HEAT TREATMENT

18A—General

18A-5. Some Aspects of Internal Oxidation in Ag, Cu, Ni and Fe-Alloys. J. L. Meijering. "Pittsburgh International Conference on Surface Reactions", 1948, p. 101-104.

Results of investigation of the possibility of hardening alloys by diffusion of oxygen into their solid solutions with small percentages of other elements having sufficient affinity for oxygen. The hardness of an alloy of Ag + 0.3% Mg was raised over 400% by heating in air at 800° C. for 2 hr. Oxidative hardening of Cu was promoted by alloying with Be, Mg, Al, or Ti. Of the Ni alloys, only Al gave important hardening effects; and all the solute metals tried with Fe were practically ineffective. (See also 4C-28, 1949.)

18A-6. Tempering in a Steam Atmosphere. Hal M. Parshall. *Machinery* (American), v. 55, Mar. 1949, p. 150-153.

Longer tool life, improved machinability of both ferrous and nonferrous parts, and increased hardness of powdered-iron parts are some of the advantages claimed for use of steam atmospheres in heat treating furnaces. Equipment and procedures.

18A-7. Age-Hardening. Marie L. V. Gayler. *Institute of Metals,* Symposium on Internal Stresses in Metals and Alloys, 1948, p. 255-264; discussion, p. 432-462.

Reviews theories of age-hardening proposed during the past 26 yrs. Recent metallographic analyses have led to the deduction that highly localized stresses are formed within the lattice during the process of age-hardening, on a sub-microscopic as well as on a microscopic scale. 38 ref.

18B—Ferrous

18B-33. Heat Treating Ferrous Metals. I. A. Usher. *Canadian Metals and Metallurgical Industries,* v. 12, Feb. 1949, p. 14-15, 21, 24, 31-33, 35.

Fundamental principles.

18B-34. Salt Bath Heating Rates. *Canadian Metals and Metallurgical Industries,* v. 12, Feb. 1949, p. 20.

Time necessary to heat steel pieces of various sizes to various temperatures in salt baths.

18B-35. Hardening Capacity of Engineered Metal Castings. C. R. Austin. *Steel,* v. 124, Feb. 21, 1949, p. 102-104, 106.

Methods of hardenability testing and factors which affect hardenability. Special properties of Meehanite cast iron in this respect. Recommends use of the Jominy end-quench test as a purchase specification for steels which are to be heat treated and hardened. Compares quenching power of oil and water.

18B-36. Heat Treatment Lowers Manufacturing Costs; An Informal Discussion for Production Men. Robert W. Campbell. *Steel Processing,* v. 35, Feb. 1949, p. 71-74, 89.

Concerned only with steel.

18B-37. Controlled Heat Treatment Increases Wear Resistance of Worm Gearing. *Product Engineering,* v. 20, Mar. 1949, p. 132.

Service life of large worm gearing used in heavy-duty, slow-speed vertical-shaft drive assemblies has been lengthened by substitution of heat treated Meehanite castings for the worms in place of case hardened worms made from SAE 1015 steel forgings.

18B-38. Carbon Correction for Steel Bars. J. D. Armour. *Steel,* v. 124, Mar. 7, 1949, p. 106-109, 144.

Maintenance or increase of surface carbon, obtainable with corrected bars, frequently provides adequate wear resistance and acceptable core toughness, at the same time eliminating subsequent machining operations. Controlled-atmosphere equipment for this heat treating operation.

18B-39. Controlled Atmospheres for Annealing Gas. C. E. Peck. *Iron and Steel Engineer,* v. 26, Feb. 1949, p. 73-85; discussion, p. 86-87.

Various types commercially applied to the annealing of a wide variety of steels.

18B-40. Practical Pointers on Steel Treating. Part III. W. R. Bennett. *Modern Machine Shop,* v. 21, Mar. 1949, p. 118-120, 122, 124, 126, 128, 130.

Salt baths for tempering and hardening; testing for hardness; preheating different steels; hardening cold striking dies.

18B-41. Cyanide Heat Treatment Gives Wear Resistance to Cast Parts. Z. T. Crittenden. *Foundry,* v. 77, Mar. 1949, p. 148, 150.

Use for camshaft sprocket gears for Pontiac engines.

18B-42. Heat Treatment of Field Welds in Steam Piping. R. O. Jackson. *Welding Journal,* v. 28, Mar. 1949, p. 266-267.

Procedures tested by experience for 0.5% Cr, 0.5% Mo main steam piping.

18B-43. How Tempering Affects Tool and Die Steels. Peter Payson. *Machinery* (American), v. 55, Mar. 1949, p. 168-170.

Effect of single and double tempering operations on structure and properties of typical tool and die steels. (Concluded.)

18B-44. Isothermal Heat Treating; A Compilation. Parts II and III. F. R. Morral. *Wire and Wire Products,* v. 24, Feb. 1949, p. 152-159; Mar. 1949, p. 236-243.

Over 400 steel analyses are tabulated in order of increasing percentages of one or more of the alloying elements present. The type of curve which each steel possesses and representative curves for Types I, II, and III alloys. 79 ref.

18B-45. How to Reduce Adverse Effects of Fabricating on Magnetic Properties of Steels. J. E. Ryan. *Materials & Methods,* v. 29, Mar. 1949, p. 49-51.

Proper annealing treatments and careful selection and control of fabricating techniques aid in maintaining high magnetic properties in electrical parts.

18B-46. Radiant Heating and Automatic Hydraulic Bending Combined to Form Steel Links. S. B. Voorhees. *Materials & Methods,* v. 29, Mar. 1949, p. 61-63.

Method involves heating bars in a radiant gas-fired furnace, then quickly forming the ends in a specially designed automatic hydraulic bending machine. After bending, the links are quenched immediately without reheating.

18B-47. Comparison of Commercial Carburizing Processes. Robert S. Burpo, Jr. *Materials & Methods,* v. 29, Mar. 1949, p. 85, 87.

Compares equipment, procedure, and results in tabular form for cyanide and activated-cyanide case hardening, salt-bath carburizing, pack carburizing and gas carburizing.

18B-48. The Stresses in Large Masses of Steel Cooling From the Austenitic Region. J. E. Russell. *Institute of Metals,* Symposium on Internal Stresses in Metals and Alloys, 1948, p. 95-106; discussion, p. 398-431.

The distinction between "tessellated" and "macro" stresses; in order to estimate the latter it is essential to determine the course of the austenite transformation and the temperature at all points of the cooling body. An approximate method of deriving these data from S-curves is outlined for a eutectoid carbon steel, and results for an 8-cm. diam. bar of such a steel are computed for two conditions of cooling. 13 ref.

18B-49. Stress-Relief Treatment of Iron Castings. *Institute of Metals,* Symposium on Internal Stresses in Metals and Alloys, 1948, p. 179-188; discussion, p. 398-431.

Recommendations for full stress relief, and for modified stress relief for stabilizing iron castings.

18B-50. Sulfiddiffusion bei der Aufkohlung von Stahl. (Sulfide Diffusion in the Carburization of Steel.) Friedrich Bischof. *Die Neue Giesserei,* v. 33-35 (new ser., v. 1), Nov. 1948, p. 153-154.

Effect of annealing time and temperature on the diffusion of sulfides into different kinds of steel.

18B-51. Ueber Schalenbildung bei Weisskerntemperguss. (Skin Formation on White-Heart Malleable Iron.) Friedrich Bischof. *Die Neue Giesserei,* v. 36 (new ser., v. 2), Jan. 1949, p. 19-22.

Causes and means of prevention. Heat treating experiments in CO-CO_2-SO_2 gas mixtures. Effect of high sulfur contents as well as carbon and sulfur diffusion. 14 ref.

18B-52. Einfluss des Gluhens im Durchziehofen auf die Festigkeitseigenschaften von verschieden vorbehandeltem Tiefziehbandstahl. (Effect of Annealing in the Continuous Tunnel-Type Furnace on the Strength Properties of Deep-Drawing Strip Steel Having Different Pretreatments.) Erich Schauff. *Stahl und Eisen,* v. 69, Jan. 20, 1949, p. 49-53.

Effects of different temperatures, rates of passage through the furnace, and rates of cooling on the strengths. 10 ref.

18B-53. Détermination rationnelle du traitement des pieces mécaniques en acier cémenté. (Rational Determination of Treatment of Machine Parts of Case Hardenable Steel.) Jacques Pomey. *Comptes Rendus* (France), v. 228, Jan. 3, 1949, p. 96-97.

A new method for preliminary heat treatment of the above steels prevents any possible changes in shape or dimensions after case hardening.

18C—Nonferrous

18C-1. How to Heat Treat Beryllium-Copper. John T. Richards. *Iron Age,* v. 163, Feb. 24, 1949, p. 78-84.

Recommendations covering hardening procedures, including handling techniques. Comprehensive physical-property data. Equipment requirements.

18C-2. Intergranular Weakness in Cartridge Brass. Fred M. Arnold. *Metal Progress,* v. 55, Feb. 1949, p. 158-162.

During production of 3-in., 50-cal. brass cartridge cases, cracks were found in discs from one mill. Experiments indicate that gas absorbed during melting and casting may be the cause. How the trouble was eliminated by an appropriate annealing schedule.

18C-3. Etude thermomagnétique des modifications structurales déterminées par revenu apres hypertrempe dans quelques ferronickels complexes. (Thermomagnetic Study of Structural Modifications Caused by Annealing After Quenching From High Temperatures (1000° C.) of Certain Complex Ferronickels.) Emile Josso. *Comptes Rendus* (France), v. 227, Dec. 20, 1948, p. 1369-1371.

Method of investigation used on a ferronickel containing 77.5% Ni, 3.6% Mo, 0.02% C, balance Fe. The method permits the qualitative and quantitative study of structural rearrangements caused by heat treatment.

18C-4. The Experiments of Boas and Honeycombe on Internal Stresses Due to Anisotropic Thermal Expansion of Pure Metals and Alloys. F. P. Bowden. *Institute of Metals,* Symposium on Internal Stresses in Metals and Alloys, 1948, p. 275-280; discussion, p. 432-462.

When noncubic metals and alloys are subjected to repeated cycles of heating and cooling, surface cracks and slip lines are observed. With cubic metals, such as lead, this does not occur. The effect is attributed to internal stresses set up by anisotropy of thermal expansion. Several experiments which support this hypothesis, and effect on casting and annealing. 11 ref.

18D—Light Metals

18D-3. Heat Treatment of Aluminum Casting Alloys. R. E. Spear and L. J. Ebert. *Iron Age,* v. 163, Mar. 3, 1949, p. 88-95; Mar. 10, 1949, p. 110-117.

Results of a correlated, comprehensive literature study covering four alloy types. Emphasis is placed on Al-Cu alloys, in the first part, with data indicating the influence of various heat treating variables on physical properties. Concluding installment deals with the Al-Si, Al-Mg, and Al-Si-Mg alloys. 22 ref.

18D-4. Why Does 75S-T Often Misbehave? C. W. Alesch. *American Machinist,* v. 93, Mar. 10, 1949, p. 88-90.

75S-T requires suitable heat treatment or it may quench crack or warp in machining. Recommended shapes to avoid these troubles.

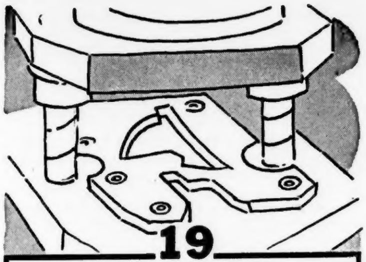
18D-5. Re-Solution Treatment of Aluminium Alloys. Paul W. Boone. *Aircraft Engineering,* v. 21, Feb. 1949, p. 56-57.

A method of improving the formability of high-strength aircraft alloys consists of heating for a short time in the precipitation heat treatment temperature range. Specific schedules for clad 14S and 24S alloys. Includes aging time vs. elongation and strength curves.

18D-6. Note sur les phénomenes observés apres traitement a haute température sur l'Aluminium de haute pureté et sur un alliage a 4% de Cuivre polis électrolytiquement. (Note on Phenomena Observed After Heat Treatment at High Temperatures of High-Purity Aluminum and an Electropolished Aluminum Alloy Containing 4% Copper.) Marie L. V. Gayler. *Journées des Etats de Surface,* 1946, p. 82-84; discussion, p. 84.

Investigation revealed the growth of grains on the surface layer after quenching from high temperatures. Mechanism of this phenomenon.

For additional annotations indexed in other sections, see:
2B-37; **3B**-45; **4A**-19; **4B**-23; **4D**-22; **16B**-22; **19B**-36-40; **19D**-18; **22B**-96



19 WORKING

19A—General

19A-53. Rex Engineering Co. Uses Press Brake to Open New Field. P. D. Aird. *Modern Industrial Press,* v. 11, Feb. 1949, p. 13-14, 16, 44.

Use in manufacture of television chassis.

19A-54. Designing of "Trouble-Free" Dies. Part XC. Types of Presses, Their Uses and Capacities. C. W. Hinman. *Modern Industrial Press,* v. 11, Feb. 1949, p. 18, 36.

Two sizes of a multiple horizontal drawing press.

19A-55. Press Work in "Overhaul and Repair" at Naval Air Station Located on the Shores of Lake Washington. *Modern Industrial Press,* v. 11, Feb. 1949, p. 50, 52, 54.

19A-56. A New Drawing Chart for Tubes. Yves Dardel. *Wire and Wire Products,* v. 24, Feb. 1949, p. 137-140.

New design chart for tube-drawing operations; method of its use.

19A-57. Merchant Wire Products. H. A. Caldwell and C. L. McGowan. *Wire and Wire Products,* v. 24, Feb. 1949, p. 147-149, 188-189.

History of their manufacturing development. A few typical types.

19A-58. Extrusion Presses; Electric Resistance Heating of Billet Containers. B. P. Brunt. *Metal Industry,* v. 74, Feb. 4, 1949, p. 91-93.

Advantages of electric heating as compared with other methods.

19A-59. Strain Gages Measure Roll Force, Torque and Strip Tension. *Iron Age,* v. 163, Feb. 24, 1949, p. 71. Based on report of Rolling Committee, British Iron & Steel Research Assn.

19A-60. Carbide Blocks Spin Tube Ends. H. Peppercorn. *American Machinist,* v. 93, Feb. 24, 1949, p. 81.

Converted screw machines spin to any radius less than 5 in., close ends or leave desired holes, make noses at any angle, or extrude tubes.

19A-61. Four Dies Produce Mast Sockets From Strip to Riveted Assembly. *Tool & Die Journal,* v. 14, Mar. 1949, p. 44-46, 48.

Detailed drawings of progressive dies for punch-press production of mast sockets for television antennas.

19A-62. Flame Spinning, A New Metal-Forming Method. *Machine and Tool Blue Book,* v. 45, Mar. 1949, p. 143-144, 146-148.

19A-63. Press Industry Churns Forward; Shows Sizeable Postwar Growth. Thomas A. Dickinson. *Western Metals,* v. 7, Feb. 1949, p. 24-26.

Activities of various western companies engaged in manufacture of press equipment.

19A-64. Deformation in Rolling. George S. Mican. *Iron and Steel Engineer,* v. 26, Feb. 1949, p. 53-67.

A new approach to metal-flow theory. The contour patterns developed under rolling or forging are shown to be related to the ratio of the height of stock worked to the horizontal component of the chord of the roll-contact arc.

19A-65. Metal Cabinets Formed Completely on a Press Brake. Charles H. Wick. *Machinery* (American), v. 55, Mar. 1949, p. 154-158.

Use of tangent-bending attachment permits metal cabinets to be completely formed on one machine. New method is especially suitable for production runs up to 200 cabinets a day per machine.

19A-66. Higher Output With Carbide Lamination Dies. *Machinery* (American), v. 55, Mar. 1949, p. 171-173.

Typical carbide dies for punching electric motor and transformer laminations. Advantages over steel dies.

19A-67. Water Lubrication of Phenolic Bearings. Frank Vogt. *Blast Furnace and Steel Plant,* v. 37, Feb. 1949, p. 201-205.

The above as used on rolling mills. Fundamental principles and design sketches. (To be continued.)

19A-68. Equipment and Method Trends in Stamping Production. Harry Sahlin. *Tool Engineer,* v. 22, Mar. 1949, p. 24-25.

19A-69. Developments in Forging Practice. Waldemar Naujoks. *Tool Engineer,* v. 22, Mar. 1949, p. 33-34.

Equipment and procedures.

19A-70. Die Set for Perforating Sheet Metal. *Machinery* (London), v. 74, Mar. 3, 1949, p. 265-267.

19A-71. Progressive Piercing, Punching, and Forming Dies. C. R. Cory. *Machinery* (London), v. 74, Mar. 3, 1949, p. 270-273.

Dies used by Fisher Body Div., General Motors Corp.

19B—Ferrous

19B-32. Fabrication of Washing Machine Wringer Parts. Walter Rudolph. *Modern Industrial Press,* v. 11, Feb. 1949, p. 38, 40, 42, 44.

Press and finishing equipment and procedures.

19B-33. The Seamless Story. J. Perc Boore. *Western Machinery and Steel World,* v. 40, Feb. 1949, p. 78-81.

Mannesmann piercing process for production of seamless tubing. Other processes. The classification of seamless steel tubing.

19B-34. Internal Forging Conveyor Chain. Gordon B. Ashmead. *Western Machinery and Steel World,* v. 40, Feb. 1949, p. 92-93.

New type of conveyer chain incorporates ball-and-socket action for free movement. Mass production of the sockets by internal forging is done by a new method, the patent for which is pending.

19B-35. Forming and Welding Operations: Key Factors in Tank Fabrication. E. F. Ross. *Steel,* v. 124, Feb. 28, 1949, p. 76-79, 94, 99.

Production of both domestic and industrial hot water tanks. High handling efficiency is combined with latest methods of forming, welding, testing, and galvanizing.

19B-36. Crucible Completes $3,200,000 Plant Improvement Program. *Steel,* v. 124, Feb. 28, 1949, p. 90, 93.

Cold-rolling and special-products divisions of the enlarged and newly-designated Spaulding Works of Crucible Steel Co. of America are now in production on a wide range of alloy, stainless, and high-carbon-steel specialties. Cold-rolling, annealing, and pickling facilities.

19B-37. Keystone Steel & Wire Modernizes Rod Mill. *Iron Age,* v. 163, Mar. 3, 1949, p. 109-110.

19B-38. Progressive Die Design. Part XIII. C. W. Hinman. *Modern Machine Shop,* v. 21, Mar. 1949, p. 134-136, 138, 140.

How transfer-slide mechanism incorporated in the design of a progressive die helps to increase production of tobacco-can covers.

19B-39. A Modern Heavy Forging Plant. W. H. Alvey. *Journal of the Iron and Steel Institute,* v. 161, Feb. 1949, p. 119-138.

Extensive details concerning equipment and layout.

19B-40. The Volume Production of Silverware. Arthur Q. Smith. *Industrial Gas,* v. 27, Feb. 1949, p. 5-7, 29-30.

Equipment and procedures used in manufacture of the stainless steel blanks on which silver is plated. Forging, rolling, heat treating.

19B-41. Republic Steel's Gadsden Pipe Mill Now Operating at Full Capacity. Charles Longenecker. *Blast Furnace and Steel Plant,* v. 37, Feb. 1949, p. 220-222.

Forming and welding equipment and procedures.

19B-42. Rolls and Rolling. Part II. E. E. Brayshaw. *Blast Furnace and Steel Plant,* v. 37, Feb. 1949, p. 206-211.

Fundamental principles of design of blooming-mill rolls. Simple diagrams showing a variety of types. (To be continued.)

19B-43. Die Sinking for Drop Forging. Part I. Die Block Selection. John Mueller. *Steel Processing,* v. 35, Feb. 1949, p. 75-78.

Manufacture and selection of die blocks as required for the different types of forgings and forging materials. (To be continued.)

19B-44. Gary Sheet and Tin Mill Modernization Completed. *Iron Age,* v. 163, Mar. 17, 1949, p. 91-93.

Rolling, shearing, trimming, annealing, cleaning and finishing facilities.

19B-45. Stresses Induced by the Shot-Peening of Leaf Springs. J. C. W. Humfrey. *Institute of Metals,* Symposium on Internal Stresses in Metals and Alloys, 1948, p. 189-193; discussion, p. 398-431.

A series of fatigue tests on vehicle leaf springs after shot-peening under various conditions; measurements of the surface compressive stresses induced by the peening. How stress values can be obtained from changes of camber. Results showing variation in compressive stress with depth.

19B-46. The Production of Favourable Internal Stresses in Helical Compression Springs by Pre-Stressing. D. G. Sopwith. *Institute of Metals,* Symposium on Internal Stresses in Metals and Alloys, 1948, p. 195-207; discussion, p. 398-431.

The load-carrying capacity of a helical compression spring can be increased considerably by pre-stressing or "scragging", i.e., compressing the spring to closure several times. This results in the introduction of favorable internal or residual shear stresses. The principles underlying the process and the distribution of the residual stresses and of the stresses under load. Application of these principles to various design problems.

19B-47. Autofrettage. A. G. Warren. *Institute of Metals,* Symposium on Internal Stresses in Metals and Alloys, 1948, p. 209-218; discussion, p. 398-431.

The load which a nonuniformly stressed structure will withstand may be considerably increased by suitable initial stresses induced by mutual action between the separate members or parts of the structure. An example of such initial stressing is the "built-up" gun. Certain discrepancies between theory and practice are due to the inadequacy of the maximum shear-stress theory of failure. A much closer agreement between theory and practice is found on the basis of the Mises-Hencky criterion of elastic failure.

19B-48. Prestretching Increases Strength of Steel T-Beams in Uni-

versity of Iowa Tests. Ned L. Ashton. *Civil Engineering,* v. 19, Mar. 1949, p. 42-43.

19B-49. Chemische Uberzuge zur Verbesserung der Kaltverformung von Stahl. (Chemical Coatings for Improvement of the Cold Working of Steel.) Wilhelm Overath. *Stahl und Eisen,* v. 68, June 17, 1948, p. 231-235.

Chemical coatings, especially phosphate coatings, and their effect on cold working. Explains the physicochemical behavior and the lubricating effect of such coatings on the various types of cold working operations. Chemical and physical properties of phosphate films. 14 ref.

19C—Nonferrous

19C-6. A Thermoelectric Study of the Cold-Rolling and Heat-Treatment of Copper. G. W. Brindley. "Report of a Conference on Strength of Solids," *The Physical Society,* 1948, p. 95-104; discussion, p. 105-106.

Data for the thermal emf. of cold rolled and heat treated copper strips relative to a standard annealed strip for a wide range of rolling reductions and annealing temperatures. Relations between emf., time, and temperature are derived on the respective suppositions that softening of cold worked metal proceeds according to single-stage or double-stage processes.

19C-7. The Disordering of β Brass by Cold Work. R. W. K. Honeycombe and W. Boas. *Australian Journal of Scientific Research,* ser. A, v. 1, June 1948, p. 190-196.

Electrical resistivities of an α-β brass, some α brasses of various zinc contents, and an aluminum bronze were measured after various deformations by wire drawing. Resistivity of the duplex alloy increases steeply after about 80% reduction in area, which increase is shown to be due to the resistivity change of the β phase.

19C-8. New, Stronger, Cylindrical Forms Produced by 4,000-Ton Squeeze. *Mechanical Topics,* v. 2, No. 2, (1948), p. 4-5.

Extrusion press which makes tubes of Monel, nickel, and Inconel in o.d.'s up to 9¼ in. and lengths up to 12 ft.

19D—Light Metals

19D-17. Stretch-Wrap Forming; Exploring the Possibilities of the New Hufford A. 50 Machine. *Aircraft Production,* v. 11, Feb. 1949, p. 62-64.

Equipment and some results obtained.

19D-18. Manufacturing Aluminum Luggage. Fred M. Burt. *Light Metal Age,* v. 7, Feb. 1949, p. 8-9, 22.

Press operations, heat treating, and finishing.

19D-19. Easy to Deep Draw Aluminum. W. E. Hoge. *American Machinist,* v. 93, Feb. 24, 1949, p. 105-108.

Deep drawing of washing-machine tubs at rates of more than 100 per hour from annealed 3S Al.

19D-20. The Distribution of Residual Stresses in the Rolling Process. Chih-Chun Hsiao. *Proceedings of the Society for Experimental Stress Analysis,* v. 6, No. 2, 1948, p. 141-149.

Experiments on residual-stress distributions in flat cold rolled aluminum plate. Quantitative residual stresses indicate that alternate passes in different directions, at the same percentage thickness reduction per pass, produce very little difference in residual stress distribution from the case of alternate passes in the same direction.

19D-21. Triple Surface Protection for Drawing and Ironing Aluminum. E. V. Crane, S. Battaglia, and H. Rottersman. *Iron Age,* v. 163, Mar. 10, 1949, p. 106-108.

Chemical, plastic, and extreme-pressure-lubricant treatments of aluminum developed for severe drawing and ironing conditions. Preparatory treatment as well as method of application of the three treatments, all of which are used simultaneously.

19D-22. Deep-Drawing One-Piece Aluminium Boat Hulls. *Machinery* (London), v. 74, Feb. 17, 1949, p. 203-204.

As done by Reynolds Metals Co., Louisville, Ky.

19D-23. How to Rubber-Form Light Metals. R. Burt Schulze. *American Machinist,* v. 93, Mar. 10, 1949, p. 101-116.

Parts of a book which deal with rubber-pad forming.

19D-24. The Relief of Internal Stresses in Aluminum Alloys by Cold Working. W. Betteridge. *Institute of Metals,* Symposium on Internal Stresses in Metals and Alloys, 1948, p. 171-177; discussion, p. 398-431.

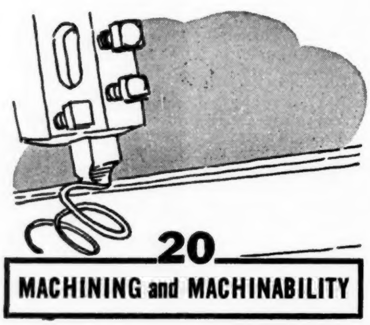
Effect of cold working on internal stresses in heat treated Al alloy samples. Considerable reduction of the stresses can be effected by cold working, and this is best applied between solution treatment and aging. The application of the process to an airplane engine impeller stamping.

19D-25. Supplementary Press Forming Operations. XI. J. W. Lengbridge. *Tool Engineer,* v. 22, Mar. 1949, p. 37-40.

Continues series on theory and practice of pressing aluminum. Operations such as expanding, contracting, flanging, and beading necessary to complete the forming of the shell, and in the shaping of hollow vessels. (To be continued.)

For additional annotations indexed in other sections, see:

2B-37; 3A-68; 3B-53; 4D-23; 18B-46; 22B-77; 24A-25-31-32



20A—General

20A-85. Planned Production. Gordon B. Ashmead. *Western Machinery and Steel World,* v. 40, Feb. 1949, p. 66-69, 94.

Miscellaneous machine-shop operations and equipment in production of precision tools for the airplane industry.

20A-86. Precision-Made Torches for Better Welding. Ralph G. Paul. *Western Machinery and Steel World,* v. 40, Feb. 1949, p. 70-73, 90, 98.

Machine-shop, cleaning, and finishing procedures.

20A-87. Tooling Specialists. Walter G. Rien. *Western Machinery and Steel World,* v. 40, Feb. 1949, p. 74-75.

Equipment of Specialty Engineering & Tool Co., Oakland, Calif.

20A-88. Modern Machines in Diesel Shop: Faster Production With "Fastermatic"; Boring Nine Bearings Simultaneously. *Western Machinery and Steel World,* v. 40, Feb. 1949, p. 76-77, 98.

Companion articles. Equipment and procedures at Enterprise Engine & Foundry Co., San Francisco.

20A-89. The Experimental Machine Shop. *Western Machinery and Steel World,* v. 40, Feb. 1949, p. 86, 98.

Work of Lovequist Engineering Co., Beverly Hills, Calif., in the main, is prototype machined parts for the aircraft industry.

20A-90. A New Manufacturing Method. *Western Machinery and Steel World,* v. 40, Feb. 1949, p. 91.

New machine tool which has seven work stations which carry the work from bar stock to finished product. Operations may include boring, turning, facing, threading, grooving, drilling, or any combination of operations performed in sequence simultaneously.

20A-91. Spinning Operation Solves Problem of Producing an Intricate Part. *Screw Machine Engineering,* v. 10, Feb. 1949, p. 28-31.

Details of screw-machine tooling for a 0.140-in. diam. chamber and a 0.040-in. diam. off center-hole within a part which has only a 1/16-in. hole drilled into its front face. In addition, a 0.1405-in. diam. cross hole is required which breaks through into the bottom of the 0.040-in. diam. off-center hole but not into the 0.040-in. diam. on-center hole.

20A-92. Two Types of Milling and Slotting Attachments for Multiple Spindle Bar Machines. *Screw Machine Engineering,* v. 10, Feb. 1949, p. 33-37.

Two types of milling and slotting attachments designed for use on the New Britain Model 60 6-spindle automatic bar machines.

20A-93. Turret Lathe Practice. E. L. Murray. *Screw Machine Engineering,* v. 10, Feb. 1949, p. 38-41.

Five basic phases in turret-lathe practice which greatly affect the efficiency of any tooling job.

20A-94. Cutting Costs With Chucking Machines. J. T. Vinbury. *Screw Machine Engineering,* v. 10, Feb. 1949, p. 43-47.

Complex part and method of production on the automatic multiple-spindle chucking machine. 21 operations are performed simultaneously.

20A-95. Table of Corrected Diameters on 10° Top-Rake Circular Tools for No. OG Brown & Sharpe Automatics. Roy M. Spaulding. *Screw Machine Engineering,* v. 10, Feb. 1949, p. 48-51.

20A-96. The Machining of "Difficult" Materials. *Aircraft Production,* v. 11, Feb. 1949, p. 65-68.

Practical information on the cutting of high-Ni alloys, stainless steels, and cast irons.

20A-97. Fixture Determines Accuracy in Milling Slender Castings. *Steel,* v. 124, Feb. 21, 1949, p. 117-118.

Recommended fixture-design characteristics.

20A-98. "Unmachinable" Turbo-Jet Parts Broached. Oliver W. Bonnafe. *American Machinist,* v. 93, Feb. 24, 1949, p. 77-80.

Heavy machines and fixtures, with careful tooling, make it possible to produce complex shapes on blade roots and in rotors and stators.

20A-99. Form Grinding Makes Better Latches. Rupert Le Grand. *American Machinist,* v. 93, Feb. 24, 1949, p. 82-83.

Production of circuit-breaker parts. Use of "toolroom" method produces a 30% time saving and improves quality.

20A-100. Improved Surface Finish Increases Tool Life. Thomas Badger. *American Machinist,* v. 93, Feb. 24, 1949, p. 86.

Experimental data. Surface-finish improvement from 30 to 5 microin. resulted in tool-life increases of 90 to 152%.

20A-101. How Counterbores Behave. *American Machinist,* v. 93, Feb. 24, 1949, p. 88-91.

Torque, thrust, and power for counterboring various materials with carbide-tipped and high speed steel tools can be computed for various feeds and speeds by use of the tables and charts presented. They are based on a comprehensive research investigation.

20A-102. Practical Ideas. *American Machinist,* v. 93, Feb. 24, 1949, p. 112-116.

Includes the following: scriber to mark arcs without center location (Clifford T. Bower); bending of U-bolts without thread damage (Dennis D. Unruh); peeling of Inconel-X round stock done on a 24-in. engine lathe by reversed process—instead of rotating the stock and turning with a fixed tool, the machine feeds the stock and the cutters revolve; toolholder for hogging cuts holds 16 bits, each of which takes a 1/16-in. cut; counterbore drills thin sheets (Bernard Levowich); dual-purpose toolholder (Dwight R. Page); broach-like planing tool slots thin plate (G. R. Milner); adaptation of lathe for special-thread cutting (William R. Baker, R. E. Moulton, and D. W. Hartzell—separate comments on contribution by Jack Everett); engine lathe fixture holds washers for boring (Roger Isetts); and other miscellaneous shop hints.

20A-103. Special Indexing Fixture Doubles Broaching Rate on Small Parts. Herbert Chase. *Steel,* v. 124, Feb. 28, 1949, p. 84-85.

Unique fixture equipped with six toggle clamps which facilitates work positioning and boosts broaching output.

20A-104. Speeds and Feeds to Use in Cylindrical Grinding. E. W. Wolff. *Iron Age,* v. 163, Mar. 3. 1949. p. 100-103.

Quick means for checking and setting up cylindrical grinding jobs to eliminate the time and material loss encountered in "cut-and-try" procedures.

20A-105. Simplified Contouring Controls. Roger Schuette. *Electrical Manufacturing,* v. 43, Mar. 1949, p. 124, 126, 128.

With one movement fixed, in and out motion of variable element is governed by a two-contact stylus, magnetic reversing clutches and a magnetic brake for contouring attachment developed for Le Blond lathes.

20A-106. Talented Tooling. *American Machinist,* v. 93, Mar. 10, 1949, p. 98-99.

Diaphragm chuck grips ring gears; magnetic chucks hold propeller blades; carbide milling replaces gang planing.

20A-107. Practical Ideas. *American Machinist,* v. 93, Mar. 10, 1949, p. 120-124.

Includes the following: magnetic extension fixture for unusual grinding jobs on a surface grinder (Harry Smith); guides position bars for centering operation; finish-forming cutter made from bar-stock disc (G. R. Milner); carbon-block fixture for welding rods together (Don McIntosh); expanding rollers clamp box for welding (William H. Genich); drilling and tapping of dial holes on simple drill-press setup (Ray Cafiero); slotted plate helps reset boring-bar babbitts (Raymond E. Baldauf); templet for lathe cutting special shapes and radii (Arthur G. Ranslow); built-up broach for finishing cast cylinders (G. R. Milner); keyway broaching on low-power machine eased by use of roller chain (G. R. Milner); and other miscellaneous shop hints.

20A-108. Work or Tool Rpm. for Cutting Speeds From 40 to 1000 Sfpm. *American Machinist,* v. 93, Mar. 10, 1949, p. 139.

A table.

20A-109. A Practical Comparison of Mass Production Machines and General Purpose Machines. E. K. Morgan. *Automotive Industries,* v. 100, Mar. 1, 1949, p. 18-20, 50.

Typical situations in which general-purpose machine tools and mass-production equipment are used in production of diesel engine cylinder blocks and crankcases of integral construction. Basic factors for each type of equipment and costs of production.

20A-110. A New Alpha Alumina Abrasive. *Machine and Tool Blue Book,* v. 45, Mar. 1949, p. 158-160, 162, 164.

Use of new type in machine-shop operations.

20A-111. Shop Hints. *Machine and Tool Blue Book,* v. 45, Mar. 1949, p. 176, 178-182, 184.

"A Quick-Acting Milling Fixture," Robert Mawson; "Cutting Short Pipe on a Milling Machine"; "Splining Large Cutter Chain Sprockets"; and "Automatic Brushing Helps Reduce Bearing Costs."

20A-112. End Form Grinding Machine. *Iron Age,* v. 163, Mar. 10, 1949, p. 102.

Certain part details require profiled grinding on the end, hence they cannot be ground on usual centerless grinding machines. A novel variation is an end-forming machine.

20A-113. An Electronic Tool Cutting Pressure Indicator. *Machinery* (London), v. 74, Feb. 10, 1949, p. 175-176.

20A-114. Metal Swarf, Cutting Oils and Coolants; Methods and Equipment Used for Effecting Economies in the Use of Cutting Oils and in the Reclamation of Metal Swarf. H. M. Harman. *Machinery Lloyd* (Overseas Edition), v. 21, Feb. 12, 1949, p. 68-80.

20A-115. Special Jig and Fixture Unifies Drilling and Inspection Procedure. Robert Mawson. *Steel,* v. 124, Mar. 14, 1949, p. 124, 126.

A typical case in which it is not necessary to locate jigs and fixtures on a finished surface. It is a caster-roll swivel bracket, which, when assembled, does not have to fit either into or against any other detail.

20A-116. Simple Method for Machining Multiple Thread Screws. Bruce Thomas. *Modern Machine Shop,* v. 21, Mar. 1949, p. 168-170, 172, 174, 176.

Recommended procedures for American Standard and square threads.

20A-117. Ideas From Readers. *Modern Machine Shop,* v. 21, Mar. 1949, p. 198, 200, 202, 204, 206, 208, 210.

"Parts Tray for Vise Carriage," Robert G. Ellis; "Drill Jig for Hollow Milling, Drilling, and Reaming," Robert Mawson; "Drill Press Used as a Centrifuge," Frank Charity; "Method of Machining Symmetrical Workpieces," Edward Diskavich.

20A-118. Toolpost Grinders in Production Operations. J. F. Fischer. *Machinery* (American), v. 55, Mar. 1949, p. 162-165.

Applications of toolpost grinders. (Second of three articles.)

20A-119. New Developments in Centerless Thread Grinding. Cecil W. Hopkins. *Machinery* (American), v. 55, Mar. 1949, p. 175-180.

New developments incorporated in machine built by Landis Machine Co. Threads up to 1⅞ in. in diam. and as coarse as 8 per in. can be ground economically from the solid.

20A-120. Tool Engineering Ideas. *Machinery* (American), v. 55, Mar. 1949, p. 193-196.

"Fixtures for Milling Drill-Chuck Jaws," Harold E. Murphey; "Double Combination Die for Producing Two Different Parts," Burnett Menkin; and "Marking Punches for Simplifying Lay-Outs," Robert Mawson.

20A-121. Drilling Square Holes on Lathe. Joseph Albin. *Iron Age,* v. 163, Mar. 17, 1949, p. 98.

20A-122. Trends in Modern Milling Machines. A. O. Schmidt. *Tool Engineer,* v. 22, Mar. 1949, p. 17-20.

Relation of cutter and milling-machine design, power requirements as affected by radial rake angles, cutting material, use of cutting fluid, etc. Tabulates power required to mill representative metals.

20A-123. Perspectives of Broaching. John A. Markstrum. *Tool Engineer,* v. 22, Mar. 1949, p. 21-23.

Developments in broaching fixtures and tools.

20A-124. Review of Tap Design and Operation. Herman Goldberg. *Tool Engineer,* v. 22, Mar. 1949, p. 26-28.

States that "more progress has been made in tapping in 1948 than in the previous 20 years." New equipment for production tapping.

20A-125. Parting Tool Design. C. E. LeRow. *Tool Engineer,* v. 22, Mar. 1949, p. 34.

Design recently patented by Westinghouse. The time required for cutting off material with this type of tool is said to be considerably shorter than with conventional cut-off tools.

20A-126. The Fundamentals of Tool Engineering. IX. A Résumé on Metal Cutting. A. E. Rylander. *Tool Engineer,* v. 22, Mar. 1949, p. 41-42.

Typical milling-machine setup. (Part of a series for the student.)

20A-127. Gadgets. *Tool Engineer,* v. 22, Mar. 1949, p. 43-44.

"Boring Bar Fabricated for Brazing," C. W. Frank; "Two Squareness Gages," Paul H. Winter; "Equalizing Fixture for Round Work," Frank J. Peragine; "Expanding Washer for Broached Work," George G. Hasselberg; and "Lipped Tong for Heavy Work," E. Guilbert.

20A-128. Davenport Automatic Produces Intricate Part With Non-Rotating Work Spindles. *Screw Machine Engineering,* v. 10, Mar. 1949, p. 21-26.

Many instances arise where, in order to perform a cross-drilling or milling operation, or to drill an eccentric hole, stopped spindles are required in one or two machine positions. Unique setup which produces a part on the automatic screw machine with all work spindles stopped in every tooling position.

20A-129. Attachments and Tools Used on Chucking Machines. *Screw Machine Engineering,* v. 10, Mar. 1949, p. 28-32.

20A-130. Turret Lathe Practice. E. L. Marray. *Screw Machine Engineering,* v. 10, Mar. 1949, p. 40-45.

Includes charts compiled as an aid in calculating power requirements for different materials at varying depths of cuts.

20A-131. Potter & Johnston 3U Speedflex Automatic Turret Lathe. *Screw Machine Engineering,* v. 10, Mar. 1949, p. 47-52.

Includes a variety of typical tooling set-ups.

20A-132. Improved Friction Saw Eliminates Burring. *Production Engineering & Management,* v. 23, Mar. 1949, p. 64.

20A-133. An Efficient Tool Grinding Room Keeps Ford Plant Humming. L. R. Lee. *Production Engineering & Management,* v. 23, Mar. 1949, p. 66-68.

20A-134. (Book.) **Cemented-Carbide Tools.** 62 pages. Machinery Publishing Co., Ltd., 52-54, High Holborn, London, W. C. 1, England. (Machinery's Yellow Back Series No. 6.)

Carbides and bonding agents used for metal cutting; the design, care and maintenance of tipped tools; production of the tools by sintering.

20A-135. (Book.) **Manual of Die-Head Thread Cutting.** H. Schlarman. 266 pages. McGraw-Hill Book Co., Inc., 330 West 42nd St., New York 18. $3.50.

A noteworthy contribution to the metalworking industry because it will help shopmen to identify everyday troubles and apply corrective measures. (From review in *American Machinist.*)

20B—Ferrous

20B-27. Controlled Power. E. O. Danielson. *Western Machinery and Steel World,* v. 40, Feb. 1949, p. 62-65, 95-97.

Foundry and machine-shop operations in production of specialized motors.

20B-28. Seattle Gear Makers. *Western Machinery and Steel World,* v. 40, Feb. 1949, p. 82-84.

Machine-shop equipment of Western Gear Works.

20B-29. Machining Small Castings. David C. McConnell. *Canadian Metals and Metallurgical Industries,* v. 12, Feb. 1949, p. 16-17, 19.

Machining of gray-iron castings for washing-machine transmission parts.

20B-30. The Production of Taper Pins, Grooved Pins and Keys. *Machinery* (London), v. 74, Feb. 3, 1949, p. 137-139.

20B-31. High-Speed Milling of Threads in Armour Plate. *Machinery* (London), v. 74, Feb. 3, 1949, p. 142-144.

Attachment by use of which single-lead modified buttress threads having outside diameters of 1.87 to 4.22 in. can be milled in armor plate up to 14 in. thick. It can be fitted to a standard drilling machine or a portable, multi-spindle, rotary turret head.

20B-32. The Machining of Stainless Steel. Part II. Lester F. Spencer. *Steel Processing,* v. 35, Feb. 1949, p. 82-85, 98.

Recommended procedures, based on survey of the literature. Corrosion resistance of free-machining stainless compositions in comparison to the usual grades. 14 ref.

20B-33. How to Grind Medium-Pitch Gears. D. W. Dudley. *American Machinist,* v. 93, Mar. 10, 1949, p. 94-97.

Suggestions based on experience in grinding precision aircraft gears.

20B-34. Pairs of Quick-Acting Fixtures Speed Broaching of Radii and Slots in Steel Components for Buick Dynaflow Converter. Herbert Chase. *Steel,* v. 124, Mar. 7, 1949, p. 110-111.

20B-35. Mass Production Flow Adapted to Small Lot Production. Gerald Eldridge Stedman. *Machine and Tool Blue Book,* v. 45, Mar. 1949, p. 123-124, 126-128, 130.

Manufacture of slush pump valves, piston rods, and other drilling equipment.

20B-36. Spline Broaching Facilitated by Using Special Indexing Fixture. *Machinery* (American), v. 55, Mar. 1949, p. 190.

20B-37. New Tooling Boosts Output on Automatic Screw Machine. *Production Engineering & Management,* v. 23, Mar. 1949, p. 65.

Use of tungsten carbide and faster cutting speeds, made possible by an improved tooling setup, reduces machine cycle time from 90 to 14.7 sec. for production of lightning-arrester plugs from SAE 1020 round bar stock.

20C—Nonferrous

20C-6. Carbide Die Construction. *Tool & Die Journal,* v. 14, Mar. 1949, p. 64, 66.

The four steps generally followed when building carbide dies: the carbide methods of holding and proper support, diamond boring, grinding, and lapping.

20C-7. Producing Square Holes on Multiple-Spindle Automatics. *Machinery* (American), v. 55, Mar. 1949, p. 160-161.

Successive steps in production of brass magnet shaft, which include rolling of the outside diameter to produce a square hole in the stem of the part.

20C-8. Control Factors for Band Sawing Copper and Copper Base Alloys. H. J. Chamberland. *Production Engineering & Management,* v. 23, Mar. 1949, p. 63-64.

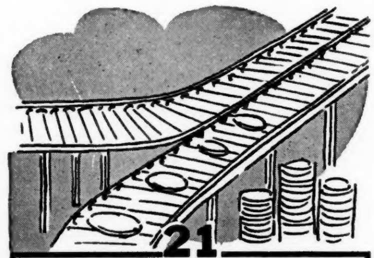
Saw life, metal-removal rate, and surface finish have been given careful consideration in establishing the recommendations presented.

20D—Light Metals

20D-7. Distortionless Broaching Thin-Walled Aluminum Castings at 30 Feet per Minute. *Steel,* v. 124, Mar. 14, 1949, p. 128.

Equipment and procedure.

For additional annotations indexed in other sections, see: 22B-81; 24A-20



21 MISCELLANEOUS FABRICATION

21A—General

21A-17. Engineering Intricate Press Parts at Ravenna Metal Products. Howard E. Jackson. *Modern Industrial Press,* v. 11, Feb. 1949, p. 30, 34, 36.

All kinds of metal are worked, in any form, with almost any type of tool. Machining, welding, grinding and polishing are done as well as shearing, drawing, and forming.

21A-18. Modern Production Found at Fawick Airflex Plant. *Modern Industrial Press,* v. 11, Feb. 1949, p. 46, 48, 56.

Production of industrial clutches, brakes, and accessory units at Cleveland plant.

21A-19. Hydraulically Formed Seamless Metal Bellows. *Machinery* (London), v. 74, Feb. 3, 1949, p. 131-136.

Methods for production by a British firm.

21A-20. Sunnyvale Plant Adds Heater Line to Production Schedule. *Western Metals,* v. 7, Feb. 1949, p. 30-31.

Production of water heaters by Westinghouse's Sunnyvale, Calif., plant.

21A-21. Shop Shots at I-T-E Circuit Breaker Co. *American Machinist,* v. 93, Mar. 10, 1949, p. 118-119.

Punch-press, machine-shop, and welding operations.

21A-22. Indian Motocycle Retools for Improved New Models. *Production Engineering & Management,* v. 23, Mar. 1949, p. 55-62.

Methods and equipment.

21A-23. Simplifying Manufacturing Methods With Air-Operated Fixtures. *Machinery* (American), v. 55, Mar. 1949, p. 181-184.

Applications in production of household vacuum cleaners.

21A-24. The Production of Washing Machine Components. *Machinery* (London), v. 74, Mar. 3, 1949, p. 259-263.

Press operations, welding, enameling, spinning, metal spraying, assembly in manufacture of Bendix Home Laundry by British firm.

21A-25. (Book.) **Production Engineering.** J. S. Murphy. Iliffe and Sons, Ltd., Dorset House, Stamford St., London, S.E. 1, England, 12s. 6d. net.

A general survey of technical, personal, and commercial problems involved in the mass production of machine parts, considered from the angle at which the student or planning engineer first approaches the subject. Assumes that the reader is conversant with machine-shop practice. Each sequence is discussed in the order in which it occurs in practice, from preliminary organization of the factory to pricing the product.

21B—Ferrous

21B-11. Significant Engineering Contributions Made to Steel Fabrication by A. O. Smith Corp. Gerald E. Stedman. *Modern Industrial Press,* v. 11, Feb. 1949, p. 22, 26, 29, 36.

Variety of methods used in various A. O. Smith plants. Press, machine-shop, and welding equipment and procedures.

21B-12. Operations in a Plate Shop. *Sheet Metal Worker,* v. 40, Feb. 1949, p. 43-44.

Press, machining and welding equipment and procedures.

21B-13. Developments in Continuous Butt Weld Pipe Mills. William Rodder. *Iron and Steel Engineer,* v. 26, Feb. 1949, p. 101-109; discussion, p. 109-111.

Shearing, forming, welding, and other coordinated units.

21B-14. Oliver's Modernized Facilities for Producing Three Tractor Models. Joseph Geschelin. *Automotive Industries,* v. 100, Mar. 1, 1949, p. 34-36, 52.

New final assembly building and rebuilt gray-iron foundry of Oliver Corp.

21B-15. Production of Ford Axle Housings. *Machinery* (London), v. 74, Feb. 10, 1949, p. 167-170.

Forming, welding, and machining.

21B-16. Strip-Wound Pressure Vessels. *Engineer,* v. 187, Feb. 11, 1949, p. 155-157.

Design and fabrication. A combination of heating, pressure rolling, and quenching is used during strip winding.

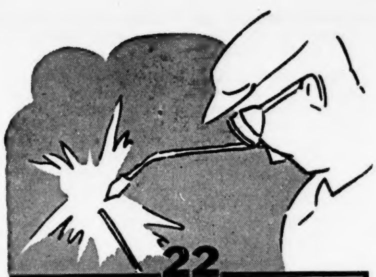
21B-17. Quality Control of Stainless Steel Strip. G. W. Paulin. *Tool & Die Journal,* v. 14, Mar. 1949, p. 74, 76.

Rolling, pickling, annealing, and tempering procedures at Allegheny Ludlum Steel Corp.

21D—Light Metals

21D-4. Contract Fabricating at Reynolds. *Modern Metals,* v. 5, Feb. 1949, p. 13-17.

A typical operation: fabricating of aluminum washing-machine tubs.



JOINING and FLAME CUTTING

22A—General

22A-50. The Welding, Brazing and Soldering of Coated Metals. E. V. Beatson. *Journal of the Electrodepositors' Technical Society,* v. 24, 1949, p. 41-56. (Preprint.)

General characteristics of the various processes in the order of ascending joining temperatures. 13 ref.

22A-51. Factors That Affect Welding Costs. *Sheet Metal Worker,* v. 40, Feb. 1949, p. 36-38, 48.

Fit-up and joint design; position; jigs and fixtures; electrodes; and welding techniques for medium gages of sheet metal.

22A-52. Comparable Arcwelding Electrodes. *Iron Age,* v. 163, Feb. 24, 1949, p. 85-96.

Tables give trade names of comparable electrodes, welding position, electrode coating used, and ASTM-AWS specification numbers. Separate tables cover mild-steel, low-alloy steel, corrosion resistant steel, stainless steel and copper arc-welding electrodes.

22A-53. Progress in Arc Welding. C. P. Croco. *Westinghouse Engineer,* v. 9, Mar. 1949, p. 34-39.

Methods and equipment. History of development.

22A-54. Power Analysis of A-C Welders. F. B. Mead. *Westinghouse Engineer,* v. 9, Mar. 1949, p. 40-41.

How to estimate power requirements by simple vector analysis of loads for both a.c. and d.c. welding machines.

22A-55. Mechanical Properties of Adhesive Bonds. *Product Engineering,* v. 20, Mar. 1949, p. 150-152. Condensed from "Shear Impact and Shear Tensile Properties of Adhesives" by Irving Silver.

Results of experimental study of bonded joints under shear-impact and shear-tensile loading. Limited to room-temperature-setting adhesives. The materials adhered were pulp-filled phenolics and commercial brass

22A-56. Superior Welding and Brazing. *Industry and Welding,* v. 22, Mar. 1949, p. 32-34, 63-64, 66-69.

Procedures and equipment of repair welding shop.

22A-57. Tungsten: To Save or Not to Save. R. W. Tuthill. *Welding Engineer,* v. 34, Mar. 1949, p. 42-45.

The problem of whether or not to protect the tungsten electrode against oxidation by means of argon. Relative costs of tungsten and argon; effects of consumed tungsten on weld properties; means of reducing tungsten composition other than by argon shielding.

22A-58. Rod Template for Stack Cutting. Phil Glanzer. *Welding Engineer,* v. 34, Mar. 1949, p. 51.

Shop-made grooved driving wheel enables the tracing unit of a portable shape-cutting machine to run on a "track" template made by bending welding rods and tacking them to a heavy base plate.

22A-59. Effectiveness of the Metal-Fusion Process During Arc Welding. (In Russian.) N. N. Rykalin. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 63, Nov. 11, 1948, p. 131-134.

Proposes formulas. Influence of factors involved. Theoretical data compared with results of experiment, showing quite close correlation.

22A-60. The Electronic Measurement and Control of Heat. Part 3. Electronics and Welding. John H. Jupe. *Electronic Engineering,* v. 21, Mar. 1949, p. 94-97.

Includes numerous circuit diagrams.

22A-61. Poke Welding Offers New Method of Joining Stainless, Aluminum and Mild Steel. F. J. Pilia. *Materials & Methods,* v. 29, Mar. 1949, p. 64-67.

See abstract from *Industry and Welding,* item 22a-258, 1948.

22A-62. Arc and Resistance Welding Developments. E. F. Potter. *Tool Engineer,* v. 22, Mar. 1949, p. 29-30.

1948 developments.

22A-63. Inert-Gas-Shielded Arc Welding Equipment. N. E. Anderson. *Welding Journal,* v. 28, Mar. 1949, p. 222-228.

Evolutionary design changes in the various parts of equipment for modern shielded-arc welding.

22A-64. The Definition of Welding Positions. E. Flintham. *Welding Journal,* v. 28, Mar. 1949, p. 229-234.

How and why the proposals made by the British Joint Committee differ from the American and Australian proposals.

22A-65. Controlling Cutting Tip Clearance. H. G. Hughey and R. B. Steele. *Welding Journal,* v. 28, Mar. 1949, p. 239-242.

Need for equipment which will follow irregular rather than flat surfaces, operate at high speeds, and be unaffected by high temperatures. New equipment provides either mechanical or "flammatic" control. The latter type uses for a spacing device a flame of conventional type which "feels" the work surface. Any rise or fall of the surface is detected by this feeler, which sends a message to an electronic control system that accurately positions the torch.

22A-66. Resistance Welding Developments. F. L. Brandt. *Welding Journal,* v. 28, Mar. 1949, p. 254-257.

The synchromatic flash welder and three-phase power-converter-controlled spot, projection, and seam welders. Fundamental principles leading to these developments.

22A-67. Production Tooling for Automatic Welding. Cecil C. Peck. *Welding Journal,* v. 28, Mar. 1949, p. 257-259.

Various types of automatic production welding machines, their advantages, and qualifications of the designer of automatic machines.

22A-68. How to Design Brackets. *Welding Journal,* v. 28, Mar. 1949, p. 260-261.

Miscellaneous welded-bracket designs.

22A-69. Designing for Welding. Part III. Wallace A. Stanley. *Welding Journal,* v. 28, Mar. 1949, p. 262-263.

Elementary principles of design for spot welding. (To be continued.)

22A-70. Robbery in the Welding Shop. R. L. Townsend. *Welding Journal,* v. 28, Mar. 1949, p. 264-265.

Power losses due to loose cable connections and small inefficient

cable sizes. Discomfort caused by poor electrode holders.

22A-71. What Welding Means to America. Part Two. Fabricated Metals Industries. T. B. Jefferson. *Welding Engineer,* v. 34, Mar. 1949, p. 48-50.

Results of a survey. (To be continued.)

22A-72. Arc Welding Data Charts for Drawing Office and Workshop. R. J. Fowler. *Welding,* v. 17, Feb. 1949, p. 67-71.

The value of charts for the standardization of methods of indicating weld design and weld procedure as regards work on mild steel. Charts can also be used in connection with the estimation of electrode quantities for different types of welds. (To be continued.)

22A-73. Heat Efficiency of Melting of Base-Metal During Arc Welding. (In Russian.) N. N. Rykalin. *Avtogennoe Delo* (Welding), Nov. 1948, p. 1-7.

Expanded version of article in *Doklady Akademii Nauk SSSR.* See item 22A-59, 1949.

22A-74. Determination of Pressure on Electrodes in Contact Welding Machines by Measurement of the Deformation of the Arm of the Machine. (In Russian.) A. Z. Blitshtein. *Avtogennoe Delo* (Welding), Nov. 1948, p. 13-14.

A new method, consisting of measuring by a micrometric device, the deformation of the arm supporting one of the electrodes during automatic welding.

22A-75. The Alloying of the Deposited Metal During Arc Welding. (In Russian.) P. S. Elistratov. *Avtogennoe Delo* (Welding), Nov. 1948, p. 18-19.

Chemical changes resulting from the different composition of the base metal, the electrode, and the electrode coating. All three of these factors should be taken into consideration for prediction of the composition of the weld metal and its characteristics.

22A-76. Industrial Process for Manufacture of a Copper-Chromium Alloy for Electrodes of Contact-Welding Machines. (In Russian.) I. M. Goryachev and E. A. Smirnova. *Avtogennoe Delo* (Welding), Nov. 1948, p. 20-21.

The influence of different electrode-alloy elements; optimum core and coating compositions; method of production; physicochemical properties of coated electrodes.

22A-77. (Book.) **Welding Fundamentals.** H. P. Rigsby. 178 pages. 1948. Pitman Publishing Corp., 2 West 45th St., New York 19. $2.75.

In this compilation of the fundamentals and principles of welding for the engineering student, the actual technique of welding is treated as secondary material. Historical development of the various welding methods and equipment needed for each. Welding gases, rods, fluxes, and types of joints, as well as the testing of welds. Standard welding symbols and a glossary of welding terms.

22B—Ferrous

22B-77. Tin Cans Grow in Brooklyn. *Sheet Metal Worker,* v. 40, Feb. 1949, p. 47-48.

Principal operations are soldering and forming.

22B-78. Laboratory Tests of Two Welded Rails. R. E. Cramer. *American Railway Engineering Association, Bulletin,* v. 50, Feb. 1949, p. 510-512.

A test of one welded rail was made for comparison with previous tests, placing the rail head in repeated tension; and another test was made with the base in repeated tension for comparison with rolling-load tests of bolted joints. Welded rail found superior.

22B-79. Welded Underwater Passageway. Bill Kolb. *Industry and Welding,* v. 22, Mar. 1949, p. 38-40, 69-71.

Welding of sections for vehicular tunnel being built under the Houston Ship Channel.

22B-80. Here's How GATX Tanks Are Made. O. H. Kuhlke. *Industry and Welding,* v. 22, Mar. 1949, p. 44-46, 48, 52.

Welding fabrication of tank cars.

22B-81. Reduction Gear Teeth Cut to Tolerances of One Ten-Thousandth of an Inch. *Steel,* v. 124, Mar. 7, 1949, p. 126.

Welding and machining in fabrication of 7½-ton gear for marine turbine-propulsion unit.

22B-82. Wrought Iron Welding Is Different. Thomas Trail. *Industry and Power,* v. 56, Mar. 1949, p. 78-80, 114.

Bead and layer welding methods, oxyacetylene, electric arc procedures, and flame cutting.

22B-83. Bethlehem Thermit Weld Repairs Ship in 72 Hours. *Western Metals,* v. 7, Feb. 1949, p. 32.

22B-84. Ship Structural Members; Comparison of Welded and Riveted Stiffeners. *Welding,* v. 17, Feb. 1949, p. 78-80. Based on paper by C. J. G. Jensen.

Results of tests on various structural combinations.

22B-85. New Welding Process Feeds Wire Through Welding Gun. *Machine and Tool Blue Book,* v. 45, Mar. 1949, p. 166-167.

"Aircomatic" process for welding heavy sections of Al and Al alloys at wire feed speeds ranging from 100 to 300 in. per min.

22B-86. Significance of Speed in Automatic Arcwelding. John H. Hruska.

Iron Age, v. 163, Mar. 10, 1949, p. 98-102.

Research into problems of crack sensitivity of parent metals and welding rods, low-temperature shock resistance, and other metallurgical properties, may often obscure the fundamentals of making good welds. The speed factor, by manual or automatic processes, must be given attention. Design factors are ranked next in importance.

22B-87. Hoover Dam Turbines Kept Turning. Fred M. Burt. *Welding Engineer,* v. 34, Mar. 1949, p. 33-35.

Methods and equipment used to apply stainless steel inlays to wear surfaces of turbine runners and wicket gates, which are rapidly eaten away by cavitation caused by a 500-ft. head of water.

22B-88. Vans Welded on Assembly Line. Gerald Eldridge Stedman. *Welding Engineer,* v. 34, Mar. 1949, p. 36-39.

Apparatus and technique.

22B-89. Better Motor Mount Costs Less. *Welding Engineer,* v. 34, Mar. 1949, p. 46-47.

New welded motor mount for the Maytag electric washer.

22B-90. Prefabricated Skeletons for Building. Ted Palmer. *Welding Engineer,* v. 34, Mar. 1949, p. 52-53.

Production of reinforcing panels for concrete construction on a giant "loom" in which the threads are 3/8 and 1/4-in. rods. Separate panels, produced in manageable sizes, are welded together at the field site.

22B-91. La fatigue des soudures. (Fatigue of Welds.) M. Ros. *Revue de Métallurgie,* v. 45, Nov. 1948, p. 421-446.

Theoretical evaluation of the quality of welds in steel independent of type of weld and of alloy joined. Method of calculation of theoretical data, particularly with respect to fatigue strength.

22B-92. Specialized Steel Mill Cutting Machines and Controls. R. F. Helmkamp and A. H. Yoch. *Welding Journal,* v. 28, Mar. 1949, p. 213-219.

Equipment and controls for handling hot materials on or off the roll line as well as gas supply and control systems.

22B-93. Welding Highway Bridges. John F. Willis. *Welding Journal,* v. 28, Mar. 1949, p. 219-221.

Some welded bridge structures either completed, under construction or soon to be advertised in the Connecticut Highway System.

22B-94. Flexible Welded Connections for Structural Steel. Emanuel Scheyer. *Welding Journal,* v. 28, Mar. 1949, p. 234-238.

New welded connections suitable for semirigid and rigid framing, as compared with the older types.

22B-95. Resistance Welding of Jet Engines. H. E. Lardge. *Welding Journal,* v. 28, Mar. 1949, p. 249-254.

The application of spot, stitch, and seam welding to jet engines. Early experiences leading to present-day applications and techniques.

22B-96. Corrosion Resistance of Powder-Cut Stainless Steels. L. E. Stark and C. R. Bishop. *Welding Journal,* v. 28, Mar. 1949, p. 104s-115s.

The heat-affected zone of powder-cut edges may be eliminated by using stabilized or extra low carbon stainless steels or by annealing the powder-cut unstabilized stainless steels. The zone may be minimized by water-quenching simultaneously with the cutting.

22B-97. Tests of Spot Welds for Light Steel Structures. Otto Graf. *Welding Journal,* v. 28, Mar. 1949, p. 116s-120s. Translated from *Zeitschrift Verein Deutscher Ingenieure,* 1949.

Substitution of plug or spot welds in place of riveted joints for light structures, especially when subjected to repeated tensile loads.

22B-98. Steel Properties Related to Welded Performance. J. Heuschkel. *Welding Journal,* v. 28, Mar. 1949, p. 135s-152s.

Total carbon and alloy content is shown to be the basic variable influencing postwelded deformation and energy absorption capacities of welded tee-joints under concentrated stress at both normal and subzero temperatures. Effects of rolling conditions, variations in quench rates resulting from variations in welding, and weld shape. Optimum pre-welded yield and ultimate strengths and pre and post-welding hardness ranges at normal and at subzero temperatures for nine steel compositions. A composite relation between total analysis and welded performance under both normal and subzero test conditions.

22B-99. Here's How Welding Research and Development Pay Off at Lukens Steel Co. Part I. W. G. Theisinger. *Industry and Welding,* v. 22, Mar. 1949, p. 26-31.

Various profitable results obtained. (To be concluded.)

22B-100. Residual Stresses Due to Welding. R. Weck. *Institute of Metals,* Symposium on Internal Stresses in Metals and Alloys, 1948, p. 119-129; discussion, p. 398-431.

Plastic deformations and residual stresses occurring in mild steel plates joined by butt welds were measured with the Tomlinson strain gage in the immediate vicinity of the weld. The stresses were found to be near the yield point, and it is believed that stresses of this magnitude are always present in welded steel. Effects of various procedural variations. Brittle failure sometimes ascribed to residual stresses appears to be due to faulty design and unsuitable material. Evidence suggests that fatigue strength may be affected by residual stresses.

22B-101. The Stress System Causing Hard-Zone Cracking in Welded Alloy Steels. J. A. Wheeler. *Institute of Metals,* Symposium on Internal Stresses in Metals and Alloys, 1948, p. 367-373; discussion, p. 463-484.

Mechanical properties of metal which cracks in relation to the stresses which act on it. Cracking can be accounted for by the combined action of macro and micro-stresses on a material embrittled by heating to high temperatures during welding. 11 ref.

22B-102. Peculiarities of Heat Processes and Size of the Welding Spot During Welding of Structural Steels. (In Russian.) A. S. Gel'man. *Avtogennoe Delo* (Welding), Nov. 1948, p. 8-13.

The dimensions of the spot determining its mechanical strength are limited by the zone of melting of the base metal and, therefore, are directly connected with the heating process. Analysis of such processes and other factors involved.

22B-103. Welded Construction Using Steels Having Different Plastic Properties. (In Russian.) G. P. Mikhailov and A. Z. Solomonikov. *Avtogennoe Delo* (Welding), Nov. 1948, p. 15.

Recommended design factors.

22B-104. The Problem of the Mechanical Properties of Metals During the Welding Process. (In Russian.) N. N. Prokhorov and P. M. Lyubalin. *Avtogennoe Delo* (Welding), Nov. 1948, p. 16-18.

The ductilities of steels of both pearlite and austenite type were investigated at temperatures approaching those of welding (1000-1400° C.) and also between 25 and 200° C. The dependence of ductility on different factors.

22B-105. Rapid Welding With Deep Penetration in the Molotov Dnieperpetrovsk Factory. (In Russian.) D. P. Lebed and D. V. Shatailo. *Avtogennoe Delo* (Welding), Nov. 1948, p. 22-23.

Optimum operating conditions and mechanical properties of welded joints.

22B-106. Melting Out and Repair of Defects in Steel Castings by Means of Arc-Welding Equipment. (In Russian.) S. V. Begun. *Avtogennoe Delo* (Welding), Nov. 1948, p. 25-26.

Small and medium-sized surface defects are first melted out, then new metal is deposited.

22C—Nonferrous

22C-9. Rubber in Engineering. The Products and Manufacturing Methods of Silentbloc, Ltd., and Andre Rubber Co., Ltd. *Automobile Engineer,* v. 39, Feb. 1949, p. 61-69.

Brass-plating technique used in the preparation of metal components for rubber-to-metal units and the molding technique for production of these parts.

22C-10. Silver Alloy Brazing Beryllium-Copper Alloys. A. M. Setapen and W. D. Warren. *Welding Journal,* v. 28, Mar. 1949, p. 243-246.

A method which permits Be-Cu alloys to be brazed with silver alloys that flow at 1145-1200° F. with subsequent development of full hardness.

22D—Light Metals

22D-15. Arc Welding of Aluminium and its Alloys. (Concluded.) A. Schärer. *Light Metals,* v. 12, Feb. 1949, p. 109-112; discussion, p. 112-114. Translated from the German. (A doctorate thesis.)

Concluding article summarizes the results of the research hitherto reported. Discussion consists of a critical commentary by E. G. West.

22D-16. Spot Welding of Titanium. *Metal Progress,* v. 55, Feb. 1949, p. 200, 252, 254. Condensed from paper by R. S. Dean, J. R. Long, E. T. Hayes, and D. C. Root, *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 171, 1947, p. 431-438.

A demonstration of the feasibility of welding titanium, rather than an exhaustive study of spot welding.

22D-17. Inert-Arc Plug Welding of Aluminum. K. N. Smith. *Industry and Welding,* v. 22, Mar. 1949, p. 58-60.

Recommended procedures.

22D-18. Porosity: A Problem in Welding Light Metals. T. Lundberg. *Welding,* v. 17, Feb. 1949, p. 72-77.

Causes and mechanism of porosity formation when arc welding aluminum and its alloys. Methods of reducing effects of hydrogen.

22D-19. The Electric Welding of Aluminium and Its Alloys. G. FitzGerald-Lee. *Aircraft Engineering,* v. 21, Feb. 1949, p. 55, 54.

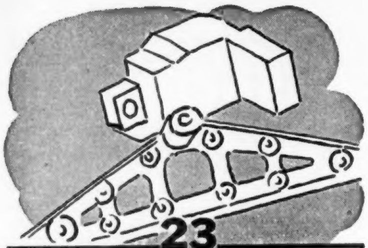
Some problems involved; recommended procedures.

22D-20. Welded Aluminum Boats. *Welding Journal,* v. 28, Mar. 1949, p. 263.

Methods of production.

For additional annotations indexed in other sections, see:

4B-21; 12-46; 19B-41; 24B-12-13



23 APPLICATIONS

23A—General

23A-5. Materials at Work. *Materials & Methods,* v. 29, Mar. 1949, p. 68-70.
An Al-alloy ship superstructure; Ni-plated small-arms ammunition; Mg racks for women's dresses used during cargo-plane shipment; powdered iron lubricating ring in handpliers; other miscellaneous items.

23B—Ferrous

23B-14. Research Report: Construction With Light Steel. B. L. Wood. *Progressive Architecture,* v. 30, Mar. 1949, p. 74-78.
New developments in dwelling and other construction.

23B-15. New Cold Finished Carbon Steel Bars Replace Higher Cost Alloy Steels. *Machine and Tool Blue Book,* v. 45, Mar. 1949, p. 172-174.
Commercial use of "Electreat" cold finished carbon steel bars to replace higher cost alloy steels.

23B-16. Hard Chrome Has Its Uses. Arthur Logozzo. *American Machinist,* v. 93, Mar. 10, 1949, p. 85-87.
Although hard chromium plating was oversold during World War II, postwar experiences have justified it for specific applications.

23C—Nonferrous

23C-16. Platinum Metals 1948 Review. Charles Engelhard. *Canadian Metals and Metallurgical Industries,* v. 12, Feb. 1949, p. 42.
Applications of Pt, Pd, Rh, Ru, Ir, and Os.

23C-17. Lock Design Features Zinc Diecastings. *Iron Age,* v. 163, Feb. 24, 1949, p. 77.
New heavy-duty tubular lock contains 20 zinc die-cast parts.

23C-18. Copper-Base Alloys for Springs. II. Harold C. R. Carlson. *Product Engineering,* v. 20, Mar. 1949, p. 86-91.
Mechanical properties of spring-brass, phosphor-bronze, Be-Cu, and other Cu-base alloy wire and strip stock for springs. Improved properties derived from cold work and heat treatments. Field of application of each alloy in mechanical and electrical products.

23D—Light Metals

23D-15. Yeoman Service. *Light Metals,* v. 12, Feb. 1949, p. 78-80.
Satisfactory service results with Al-alloy drag-line bucket.

23D-16. Aluminum Foil Used in Aerial Mapping. *Light Metal Age,* v. 7, Feb. 1949, p. 26.
In surveying of jungle terrain, recognition of and return to selected points during aerial mapping is facilitated by dropping 325-ft. rolls of Al foil. These unroll and are readily visible for miles around.

23D-17. The Advantages of Magnesium Extrusions in Design and Assembly. *Magazine of Magnesium,* Feb. 1949, p. 2-5.
Typical mechanical properties of three extruded forms of seven commercial Mg alloys.

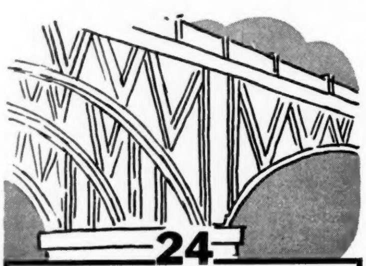
23D-18. University of Minnesota Field House Reroofed With Aluminum Sheet. *Sheet Metal Worker,* v. 40, Feb. 1949, p. 33, 35.

23D-19. First Aluminum Bascule Bridge. *Modern Metals,* v. 5, Feb. 1949, p. 23-24.
Bridge was recently erected in England.

23D-20. Magnesium as a Shipboard Material; Neagtive Considerations. T. W. McConville. *Journal of the American Society of Naval Engineers,* v. 61, Feb. 1949, p. 35-44.
Experimental work indicates that use of Mg or Mg alloys, as now known, while advantageous for weight saving, would be undesirable in view of the fire hazard, for vessels likely to be subjected to gunfire.

23D-21. Aluminum Wire: The Alloys Appropriate to Wire Manufacture. D. C. G. Lees. *Wire and Wire Products,* v. 24, Mar. 1949, p. 244-247; discussion, p. 247, 282-284.
British experiences in the use of Al alloys for wire, and recommended alloys for various electrical and nonelectrical wire applications. (First of series of lectures; includes introductory remarks by Peter Smith.)

For additional annotations indexed in other sections, see:
1C-25; 3A-60; 3B-50; 14D-14



24 DESIGN

24A—General

24A-22. Design in Logic: The Planet Satellite. *Magazine of Magnesium,* Feb. 1949, p. 8-11. Reprinted from *Flight,* July 15, 1948.
Details of the design of unorthodox British four-seater personal aircraft made by Planet Aircraft, Ltd., and named the "Satellite". Magnesium is used extensively.

24A-23. Physical Aspects of Insect Wire Screening. Ralph W. Bacon. *Wire and Wire Products,* v. 24, Feb. 1949, p. 142-146.
Physical characteristics of various types and mesh sizes of insect wire screening: relative strength, resistance to bending and abrasion, expansion and contraction, and obstruction to the free passage of light and air. Both ferrous and nonferrous screening were tested.

24A-24. Why Can't Closer Tolerances Be Held for Coiled Springs Commercially? Part II. (Concluded.) *Mainspring,* v. 12, Feb. 1949, p. 3, 6-7.
Variation in free length is the 5th variable now discussed.

24A-25. Blank Diameters for Deep-Drawn Cones. B. Spector. *American Machinist,* v. 93, Feb. 24, 1949, p. 84-86.
Diagrams and mathematics which eliminate guesswork in determining blank size of dies for deep drawing cones.

24A-26. Effects of Impact on Simple Elastic Structures. J. M. Frankland. *Proceedings of the Society for Experimental Stress Analysis,* v. 6, no. 2, 1948, p. 7-25; discussion, p. 25-27.
Elementary terms and factors concerned in the problem of impact loading. Representative cases of impact loading and their effects upon a simple undamped system with one degree of freedom. Means of judging to what degree the behavior of the idealized system is realized among actual ship and other structures. Applications to the strength of structures under impact. Design of instruments for making observations during impact tests and interpretation of their records. Formal mathematical treatment is given in the appendixes.

24A-27. A Method of Estimating Equivalent Static Loads in Simple Elastic Structures. G. E. Hudson. *Proceedings of the Society for Experimental Stress Analysis,* v. 6, no. 2, 1948, p. 28-40.
A graphical method of estimating the static load which will produce a deflection of a simple structure equal to its peak deflection under a dynamic load. The method also permits estimation of peak deflection and time to reach this peak. A general means of finding graphically the motion of such a linear elastic system under dynamic loading.

24A-28. Studies of Continuous Bridge Trusses With Models. W. J. Eney. *Proceedings of the Society for Experimental Stress Analysis,* v. 6, no. 2, 1948, p. 94-105.
Development and use of bolted brass-spring models. Design of the model and its use to determine influence lines for pier reactions, truss deflections, and jacking forces.

24A-29. Designed With Textured Metals. Howard Ketcham. *Product Engineering,* v. 20, Mar. 1949, p. 102-106.
Various applications of the 18 standard patterns made by Rigidized Metal Corp.

24A-30. Determining and Scribing Radii "Off the Board." *Tool & Die Journal,* v. 14, Mar. 1949, p. 56, 58, 82.
Calculations and diagrams for use in layout of plate-blanking dies.

24A-31. Punch and Die Construction Practices. Movable Stock-Guides for Blanking Dies. Federico Strasser. *Tool & Die Journal,* v. 14, Mar. 1949, p. 60-61.

24A-32. A Combination Piercing, Cut-Off and Bend Die. *Tool & Die Journal,* v. 14, Mar. 1949, p. 61-62.

24A-33. Stresses in Turbine Rotors of Disc Construction. G. F. C. Rogers. *Engineering,* v. 167, Feb. 11, 1949, p. 121-122.
Welded rotors with solid discs result in lighter-weight construction, for the same allowable stresses, than discs mounted on a shaft. Method for calculating stresses in rotors of the welded-disc type. Results of dimensionless plotting.

24A-34. A Designer Looks at Electroplating. J. S. McDaniel. *Plating,* v. 36, Mar. 1949, p. 234, 277.
A general discussion.

24A-35. Temperature Stresses in Gas Turbine Rotors at Starting. A. Meldahl. *Brown Boveri Review,* v. 35, Sept.-Oct. 1948, p. 247-252.
A mathematical analysis. Internal stresses arising from temperature differences are calculated and results plotted.

24A-36. Chance Laws Aid Designer in Assigning Tolerances. *SAE Journal,* v. 57, Mar. 1949, p. 24-26. Based on

"Cost-Cutting Chance Laws Can Control Design Tolerances," by Dorian Shainin.

Use of statistical methods to assign tolerances to the dimensions of a product while it is still in the design stage. Includes nomogram and chart for combining tolerances statistically.

24A-37. Elastic and Plastic Buckling of Simply Supported Metalite Type Sandwich Plates in Compression. Paul Seide and Elbridge Z. Stowell. *National Advisory Committee for Aeronautics,* Technical Note no. 1822, Feb. 1949, 24 pages.

Solution of the problem of the compressive buckling of simply supported, flat, rectangular, Metalite-type sandwich plates stressed either in the elastic range or in the plastic range. Charts for the analysis of long sandwich plates having face materials of 24S-T3 Al alloy, 75S-T6 Alclad Al alloy, and stainless steel.

24A-38. The Buckling of Parallel Simply Supported Tension and Compression Members Connected by Elastic Deflectional Springs. Paul Seide and John F. Eppler. *National Advisory Committee for Aeronautics,* Technical Note no. 1823, Feb. 1949, 18 pages.

Mathematical investigation as an approximation to the problem of the effect of finite stiffness of ribs and tension surface on the buckling load of the compression surface of a wing.

24A-39. Some New Problems on Shells and Thin Structures. V. S. Vlasov. *National Advisory Committee for Aeronautics,* Technical Memorandum no. 1204, Mar. 1949, 46 pages. Translated from *Izvestia Akademii Nauk SSSR* (Bulletin of the Academy of Sciences of the USSR), No. 1, 1947.

A theory of cylindrical shells is developed. Application to stress analysis, vibration analysis, and buckling analysis of shells.

24A-40. The Design of Surface Broaches. Artur Schatz. *Machinery* (American), v. 55, Mar. 1949, p. 143-148.

Surface-broach design cannot be accomplished by mathematical means alone. Factors influencing the design of the broach that originate in the work, the machining operation, the broaching machine, and the method of tool manufacture and their relationships.

24A-41. Figuring Weights or Dimensions of Similar Shapes. Fred B. Money. *Machinery* (American), v. 55, Mar. 1949, p. 149.

Mathematical shortcuts, frequently useful in the metal trades, particularly in forging and casting.

24A-42. Three-Dimensional Solution for the Stress Concentration Around a Circular Hole in a Plate of Arbitrary Thickness. E. Sternberg and M. A. Sadowsky. *Journal of Applied Mechanics,* v. 16 *(Transactions of the American Society of Mechanical Engineers,* v. 71), Mar. 1949, p. 27-38.

24A-43. The Basic Elastic Theory of Vessel Heads Under Internal Pressure. G. W. Watts and W. R. Burrows. *Journal of Applied Mechanics,* v. 16 *(Transactions of the American Society of Mechanical Engineers,* v. 71), Mar. 1949, p. 55-73.

Means for calculating internal-pressure stresses and deformations at or near the junctures of semi-infinite cylindrical vessel shells with several standard head shapes. A system of dimensionless variables is proposed for each head shape. Methods of showing critical head stresses in terms of these dimensionless variables either by graphs or by tabulations. 47 ref.

24A-44. On the Stability of Plates Reinforced by Ribs. J. M. Klitchieff. *Journal of Applied Mechanics,* v. 16. *(Transactions of the American Society of Mechanical Engineers,* v. 71), Mar. 1949, p. 74-76.

An expression is developed which gives directly the required rigidity of the ribs by transformation of the expression for critical compressive forces developed by Timoshenko. Use of trigonometric series is made to calculate effective width of plate. A numerical example compares results with those obtained by use of Lloyd's Rules (1931-1932) for cargo ship design.

24-45. Theory of the Damped Dynamic Vibration Absorber for Inertial Disturbances. J. E. Brock. *Journal of Applied Mechanics,* v. 16 *(Transactions of the American Society of Mechanical Engineers,* v. 71), Mar. 1949, p. 86-92.

Theory is developed mathematically for the case in which the amplitude of the disturbing force varies as the square of its frequency. Such cases are of practical importance; for example, disturbances due to unbalance in rotating machinery are of this type.

24A-46. Thick Cylinders and Interference Fits. N. P. Skinner. *Machinery* (London), v. 74, Feb. 24, 1949, p. 234-237.

Graphical methods which lead to considerable simplification in determining the wall thickness of thick cylinders and the amount of interference required for shrinkage fits. Examples.

24A-47. Corrosion Prevention; Influence of Correct Design of Metal Structures. G. T. Colegate. *Meal Industry,* v. 74, Feb. 18, 1949, p. 123-125; Feb. 25, 1949, p. 151-153; Mar. 4, 1949, p. 167-168.

Minimization of corrosion is to some extent dependent on design. The types of corrosion that can be avoided in this way and the methods adopted.

24A-48. Principles of Structural Design for Minimum Weight. F. R. Shanley. *Journal of the Aeronautical Sciences,* v. 16, Mar. 1949, p. 133-149, 188.

How determination of the lightest practical arrangement of material which will transmit the required loads through the specified distances may be accomplished by use of a structural index. Examples include the tubular column, stiffened flat plate under axial load, the unstiffened plate with edge support, shear-carrying members, and cylindrical shells in bending. Methods of comparing various materials on a weight basis are applied to several aluminum alloys, magnesium alloy, and stainless steel.

24A-49. Sur la détermination des tensions dans une membrane dépourvue de raideur. (Concerning the Determination of Stresses in Nonrigid Membranes.) Henri Pailloux. *Comptes Rendus* (France), v. 228, Jan. 3, 1949, p. 54-56.

Equations are proposed for the relationship between stresses and deformations. These equations are interpreted for different variables and a method for determination of the above is indicated.

24A-50. Oscillatory Sliding Friction (The Frictionless Bearing). Stephan Thyssen-Bornemisza. *Microtecnic* (English Edition), v. 11, Dec. 1948, p. 254-262. Translated from the German.

New type of bearing in which friction is reduced to 0.1-0.01 of normal sliding friction. Experimental setup developed to make comparative analyses of friction in the two types. Use for steel-steel combinations in which surface conditions, angles of oscillation, etc., were varied. (To be continued.)

24B—Ferrous

24B-7. Comparison of Web Stresses in 131-lb. RE and 140 PS—(Pennsylvania) Sections. *American Railway Engineering Association, Bulletin,* v. 50, Feb. 1949, p. 558-566.

Stresses in the 140-PS rail-section design were determined in the laboratory and in service. Results indicate that this design, which replaces the 131-RE design, is satisfactory; and that laboratory stress measurements forecast the reduction in service stress with satisfactory accuracy.

24B-8. Service Tests of Manganese Crossings. *American Railway Engineering Association, Bulletin,* v. 50, Feb. 1949, p. 572-579.

Results of comparative tests of various designs of solid Mn-steel crossing frogs, tests of Mn-steel insert and solid Mn-steel crossings on structural steel and longitudinal timber supports, and tests of crossing frog-bolt tension.

24B-9. Spherical High Pressure Containers Meet Severe Service Requirements by Two-Piece Welded Construction. D. Mapes. *Steel,* v. 124, Feb. 21, 1949, p. 98-99.

Fabrication of containers for methyl bromide, when the latter is used as a fire-extinguishing agent for engines in certain types of aircraft. Design principles and manufacturing methods.

24B-10. Torsional Strength of Steel Tubing as Affected by Length. William Le Fevre, Jr. *Product Engineering,* v. 20, Mar. 1949, p. 133-136.

Results of torsional-strength tests for various wall thickness-diameter-length combinations.

24B-11. ASME Boiler Code. *Mechanical Engineering,* v. 71, Mar. 1949, p. 259-262.

Tables give maximum allowable design stresses for Ni and Ni alloys and charts for determining shell thicknesses of unfired cylindrical vessels of Monel, Inconel and nickel plate, SB-162.

24B-12. Tests of Large Welded-Steel Box Girders; Bending Tests at Different Temperatures. Ambrose H. Stang and Bernard S. Jaffe. *Welding Journal,* v. 28, Mar. 1949, p. 89s-97s.

Previously abstracted from *Journal of Research of the National Bureau of Standards.* See item 24b-112, 1948.

24B-13. (Book.) **Design of Steel Buildings. Ed. 3.** Harold D. Hauf and Henry A. Pfisterer. John Wiley & Sons, Inc., 440 Fourth Ave., New York 16.

Rewritten and brought up to date to conform with the 1946 revision of the American Institute of Steel Construction specifications. An expanded treatment of welded construction is also included.

24C—Nonferrous

24C-1. Die Casting Die Design. Part III. The Disposition of the Die Cavity. H. K. Barton and James L. Erickson. *Tool & Die Journal,* v. 14, Mar. 1949, p. 49-50, 52-54, 94.

Design principles clarified by diagrams.

24C-2. Saving on Shaving. *Die Castings,* v. 7, Mar. 1949, p. 34-35, 38.

Cost cutting is one of three reasons why several parts of the Remington electric shaver are being die cast in zinc. Other reasons are improved styling and superior functional design.

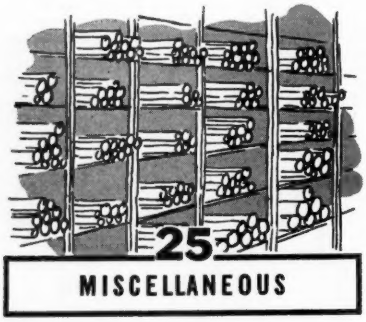
24D—Light Metals

24D-2. Magnesium Castings Designed for Aircraft Engines. M. H. Young and A. G. Slachta. *American Foundryman*, v. 15, Mar. 1949, p. 41-45.

Stress-analysis and static and dynamic test methods used to discover inadequacies in design. Points to be guarded against by the engine designer and by the foundryman.

For additional annotations indexed in other sections, see:

3A-67; 3B-52; 8-50; 9-82-95; 14A-36; 14C-27; 19B-38-46; 22A-68-69; 22B-94-103



25A—General

25A-38. Recent Milestones in Metals and Minerals. John D. Sullivan. *ASTM Bulletin*, Jan. 1949, p. 41-46.

Developments in winning raw materials from nature and making available various metal and mineral products to satisfy human wants. Some of the new materials now available, and probable trends in the immediate future.

25A-39. Canada's Mineral Production. Record Value for 1948. H. McLeod. *Canadian Mining Journal*, v. 70, Feb. 1949, p. 62-72.

25A-40. Lubrication of Metal Surfaces by Silicone Films. J. N. Gregory and Marjorie J. Newing. *Australian Journal of Scientific Research*, ser. A, v. 1, Mar. 1948, p. 85-97.

Molecular layers of the mono and diethyl and mono and di-isoamyl silicones on various metal surfaces were tested for their boundary lubricating properties. These materials have unusual thermal stability and resistance to wear.

25A-41. Collisions Through Liquid Layers. D. Tabor. *Engineering*, v. 167, Feb. 18, 1949, p. 145-147.

The nature of contact between colliding metal surfaces is of general interest in lubrication problems. When impact occurs between relatively long bodies, the process is largely due to generation and reflection of a compression wave in the colliding bodies. For small bodies, however, the process is determined mainly by deformations occurring at points of contact and the effect of the elastic compression wave can be ignored.

25A-42. Air Stored in Building Framework. Elton Sterrett. *Welding Engineer*, v. 34, Mar. 1949, p. 40-41, 45.

Unique compressed-air storage system. The hollow, welded, tubular framework of a Quonset-type structure provides 470 cu. ft. of capacity.

25A-43. Getting the Most Out of Friction-Type Bearings. H. L. Smith. *Iron Age*, v. 163, Mar. 3, 1949, p. 96-99.

Oil-groove location, surface finish, babbitt-layer thickness, clearance, and other variables affecting the life and service of both nonprecision and precision bearings. Effect of inertia load on precision-bearing design and testing; load-carrying abilities.

25A-44. Ferroalloy Metals. R. G. Knickerbocker. *Journal of Metals; Mining Engineering; Journal of Petroleum Technology*, v. 1, sec. 2, Mar. 1949, p. 95-97.

1948 commercial and technical developments.

25A-45. Mineral Economics in 1948. Paul M. Tyler. *Mining Congress Journal*, v. 35, Feb. 1949, p. 101-103, 109.

25A-46. Mineral Position of ECA Nations. No. 12. Sweden. Geoffrey Smith. **No. 13. Norway.** Arne Solem. **No. 14. Finland.** Herman Stigzelius. *Engineering and Mining Journal*, v. 150, Mar. 1949, p. 78-83.

Present status of mineral reserves and the mining and concentration industry. (Concludes series.)

25A-47. Static Friction of Two Rough Surfaces. (In Russian.) I. V. Kragels'kii. *Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk* (Bulletin of the Academy of Sciences of the USSR, Section of Technical Sciences), Oct. 1948, p. 1621-1625.

A mathematical analysis. Formulas for determination of coefficient of friction. Factors involved in this phenomenon.

25A-48. (Book.) **Standard Metal Directory; 1948-49. Ed. 11.** 999 pages. Atlas Publishing Co., 425 W. 25th St., New York 1, N. Y. $15.00.

Five sections, embracing iron and steel plants; ferrous and nonferrous metals, and a new section called: "Metal Products Index" which lists geograhpically distributors of steel and metal products. Contains more than 10,000 detailed reports on steel mills, foundries, smelters, rolling mills and nonferrous metal plants, located in the U. S. and Canada. Also contains special lists of producers and distributors of pig iron, ores, ferroalloys; metal powder producers and sellers; smelters of primary and secondary nonferrous metals; storage battery manufacturers; galvanizing plants; railroad purchasing agents; aircraft manufacturers; dealers in used pipe and rails; scrap-iron and scrap-metal dealers; importers and exporters.

25A-49. (Book) **Quin's Metal Handbook and Statistics. Part I. Non-Ferrous Metals. Part II. Iron and Steel. Ed. 35.** F. B. Rice-Oxley, compiler. 388 and 164 pages, respectively. Metal Information Bureau. Ltd., Princes House, 39 Jermyn St., London, S.W.1, England. 10s. and 7s., 6d., respectively.

World-wide commercial and technical information.

25B—Ferrous

25B-13. The Steel Industry in 1948. R. C. Todd. *Journal of American Zinc Institute*, v. 26, 1948, p. 23-30; discussion, p. 31.

Statistics; political attacks on the steel industry.

25B-14. Ship 84,693,010 Gross Tons Lake Superior Iron Ore in 1948. *Skillings' Mining Review*, v. 37, Mar. 12, 1949, p. 1-2.

Amounts shipped from each mine are tabulated along with comparative figures for 1947.

25B-15. The Steel Industry in Soviet Russia. *British Steelmaker*, v. 15, Feb. 1949, p. 60-65.

Information concerning the Mar. 1946 5-yr. plan and progress to date.

25B-16. Review of Iron and Steel Literature for 1948. E. H. McClelland. *Blast Furnace and Steel Plant*, v. 37, Feb. 1949, p. 217-219, 248-249, 251, 253, 255.

32nd annual review of iron and steel literature compiled for *Blast Furnace and Steel Plant*. Concerned only with separately published books and pamphlets.

25B-17. Manganese Iron. P. F. Hancock. *Foundry Trade Journal*, v. 86, Feb. 3, 1949, p. 91-96.

Various types and compositions; foundry practice; heat treatment; mechanical and physical properties; metallographic structure; applications.

25B-18. How Much Steel Capacity? *Steel*, v. 124, Mar. 21, 1949, p. 69-80.

Current thinking pertaining to steelmaking capacity as it relates to production and prospective consumption. Includes investigation by William C. Buell, Jr.; reports by Wilfred Sykes, Louis H. Bean, Bradford B. Smith, Otto Brubaker.

25B-19. Steel for the West. F. B. DeLong. *Wire and Wire Products*, v. 24, Mar. 1949, p. 248-249, 278-281.

Economic problems.

25B-20. (Book) **Directory Giving List of Companies and Officials Operating Blast Furnaces, Steel Plants, Rolling Mills, By-Product Coking Plants, Structural Steel Plants, Boiler and Tank Shops in the United States and Canada.** 462 pages. 1949. Steel Publications, Inc., 108 Smithfield St., Pittsburgh 30, Pa.

25C—Nonferrous

25C-7. The Birth of an Alloy. The Development of Nimonic 80 by the Mond Nickel Company, Limited. D. G. P. Paterson. *Sheet Metal Industries*, v. 25, Oct. 1948, p. 2029-2037.

Research facilities and organization of British company. History of the development of the above turbine-blade alloy, composition of which is 19-22% Cr, 1.5-3.0% Ti, 0.5-1.5% Al, 5.0% Fe max., 1.0% Mn max., 1.0% Si max., 0.1% C max., balance Ni.

25C-8. Copper and Copper Alloys; Technical Progress in 1948. (Concluded.) E. Voce. *Metallurgia*, v. 39, Jan. 1949, p. 146-148.

A review. This section deals with plating and finishing, properties, corrosion, and analysis and testing. 36 ref.

25C-9. What's Ahead for Metals in the Farm Market. R. D. Stewart. *Journal of American Zinc Institute*, v. 26, 1948, p. 13-16.

An economic analysis, with emphasis on galvanized-steel products.

25C-10. The Zinc Smelting Industry in the United States. R. A. Young. *Journal of American Zinc Institute*, v. 26, 1948, p. 31-39.

Statistics.

25C-11. Zinc Mining in the Western States. J. K. Richardson. *Journal of American Zinc Institute*, v. 26, 1948, p. 94-101.

Economic factors.

25C-12. Zinc Mining in the Central States. O. W. Bilharz. *Journal of American Zinc Institute*, v. 26, 1948, p. 102-105.

Economic factors, including statistics.

25C-13. Zinc Mining in the Eastern States. R. J. Mechin. *Journal of American Zinc Institute*, v. 26, 1948, p. 105-113.

Economic factors, including statistical graphs.

25C-14. The World Situation in Zinc. S. D. Strauss. *Journal of American Zinc Institute,* v. 26, 1948, p. 114-125; discussion, p. 125-126.
Includes statistical table.

25C-15. Metallurgy and Utility of the Less Common Metals. D. J. Maykuth. *Metals Review,* v. 22, Feb. 1949, p. 5-8.
Developments of the past year in Ti, Zr, W, Ta, Cb, U, Th, Be, and other metals. Also reviews articles on metallurgical applications of radioactive tracers. (References to "A.S.M. Review of Metal Literature".

25C-16. Mine Production of Copper in the United States in 1948. *Skillings' Mining Review,* v. 37, Feb. 19, 1949, p. 1, 4.
Statistics by states.

25C-17. U. S. Ready to Prove It Can Do Without Russian Manganese. George F. Sullivan. *Iron Age,* v. 163, Mar. 10, 1949, p. 151-152.

25C-18. Copper Outlook, Production, Demand, Price. Joseph W. Mullally. *Metals,* v. 19, Feb. 1949, p. 7, 9.

25C-19. Stockpiling, Rearmament Will Affect Lead. R. L. Ziegfeld. *Metals,* v. 19, Feb. 1949, p. 10-11.

25C-20. Outlook for Nonferrous Metals. Simon D. Strauss. *Mining Congress Journal,* v. 35, Feb. 1949, p. 38-41.
An economic survey.

25C-21. Ferroalloys and Other Strategic Metals. S. H. Williston. *Mining Congress Journal,* v. 35, Feb. 1949, p. 66-68.
Present economic status and trends.

25C-22. Doemstic Silver Production Largest Since 1943. Pat McCarran. *Mining Congress Journal,* v. 35, Feb. 1949, p. 107-109.
Statistics and economic factors.

25C-23. Review of Zinc Industry for Year 1948. Part I. (To be concluded.) Ernest V. Gent. *Metals,* v. 19, Feb. 1949, p. 12-13.
Includes tabular data.

25C-24. (Book) **Metal Industry Handbook and Directory for 1948.** 480 pages. Louis Cassier Co., Ltd., Dorset House, Stamford St., London, S.E.1, England.
An encyclopedia of British nonferrous metals and electroplating. Divided into four sections: general properties and mechanical treatment of metals and alloys; general data and tables; electroplating; and directory.

25D—Light Metals

25D-1. Research in the Non-Ferrous Industries of Great Britain. D. C. G. Lees. *Metal Treatment and Drop Forging,* v. 15, Winter 1948-9, p. 167-176.
Second of series deals mainly with research on Al and Mg. (To be continued.)

25D-2. Progress in Titanium Told at Naval Research Symposium. T. C. Du Mond. *Materials & Methods,* v. 29, Feb. 1949, p. 45-47.
Reviews proceedings of recent symposium. Illustrations show machined, formed, forged, and welded titanium.

25D-3. Aluminum Review. *Light Metal Age,* v. 7, Feb. 1949, p. 10-11, 18-19, 24.
Developments of 1948 in commercial production and applications. Procedures and equipment of Permanente Metals Corp., Mead, Wash.

25D-4. How to Avoid Watermarks on Aluminum. G. W. Birdsall. *Steel,* v. 124, Feb. 28, 1949, p. 86, 88.
Good storage practice which prevents stains left by chemical-loaded water.

25D-5. Titanium. *Metal Progress,* v. 55, Feb. 1949, p. 185-200, 252, 254.
Based on papers presented at a recent symposium sponsored by the Office of Naval Research. Four articles deal with titanium programs of the military agencies; seven with production and fabrication of the metal. Individual articles are abstracted separately.

25D-6. The Titanium Program of the Navy Bureau of Aeronautics. N. E. Promisel. *Metal Progress,* v. 55, Feb. 1949, p. 186.

25D-7. The Titanium Program of Army Ordnance. L. S. Foster. *Metal Progress,* v. 55, Feb. 1949, p. 187.

25D-8. The Titanium Program of the Air Materiel Command. Richard R. Kennedy. *Metal Progress,* v. 55, Feb. 1949, p. 187.

25D-9. The Titanium Program of the Naval Research Laboratory. E. J. Chapin. *Metal Progress,* v. 55, Feb. 1949, p. 188.

25D-10. Aluminum Metallurgy. Paul P. Zeigler. *Journal of Metals; Mining Engineering; Journal of Petroleum Technology,* v. 1, sec. 2, Mar. 1949, p. 84-85.
1948 commercial and metallurgical developments.

25D-11. Magnesium Industry. J. D. Hanawalt. *Journal of Metals; Mining Engineering; Journal of Petroleum Technology,* v. 1, sec. 2, Mar. 1949, p. 86-87.
Metallurgical progress in electroplating, welding, and brazing, and other aspects.

25D-12. Aluminum. Donald M. White. *Mining Congress Journal,* v. 35, Feb. 1949, p. 106, 114.
Present economic status and trends.

25D-13. (Book) **The Story of Magnesium.** W. H. Gross. 260 pages. American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio. $1.50.
First of a series of "Techbooks" whose purpose is to provide nonengineering graduates with the technical information needed to understand properly the science of metals as it is applied in industrial production. Suitable for use as self-educational material.

Metallurgy Course Given

A course in "Metallurgical Materials and Processes" is being presented by East Los Angeles Junior College on Monday evenings during the spring semester. The course is sponsored by the American Society for Metals and the American Foundrymen's Society.

The course is under the direction of E. K. Smith, consulting metallurgist. With an enrollment of 99, interest in the class is high and attendance excellent, according to Clarence E. Guse, coordinator of the industry division of the college.

X-Ray Firm Changes Name

In order to avoid confusion among the medical and industrial users of X-ray, the name of the Victor X-Ray Corp. of Canada, Ltd., has been changed to General Electric X-Ray Corp., Ltd., paralleling the name of its U.S. affiliate.

EMPLOYMENT SERVICE BUREAU

The Employment Service Bureau is operated as a service to members of the American Society for Metals and no charge is made for advertising insertions. The "Positions Wanted" column, however, is restricted to members in good standing of the A.S.M. Ads are limited to 50 words and only one insertion of any one ad. Address answers care of A.S.M., 7301 Euclid Ave., Cleveland 3, O., unless otherwise stated.

POSITIONS OPEN

EAST

TECHNICAL CORRESPONDENT: Manager wanted with sufficient knowledge of metallurgy or mechanical engineering or chemistry to expand and manage one of these departments of our employment placement service, operating nationally by mail. Female or male, able to compose and type substantially perfect letters. Position at our Stamford headquarters. Type letter detailing education, experience. Scientists' and Engineers' Assn., 51 Rock Rimmon Road, Stamford, Conn.

ATTRACTIVE POSITION: For young man —28 to 40—who has metallurgical and sales training. Knowledge of metal finishing desirable but not essential. Box 4-5.

MATERIALS ENGINEER: Graduate in metallurgy or chemical engineering with practical industrial experience in heat treating and standardization of ferrous and nonferrous metals. Some mechanical engineering experience desirable. Box 4-10.

CIVIL SERVICE

ENGINEER, MINING ENGINEER, AND METALLURGIST: Positions in Washington, D. C., and in the case of mining engineer, throughout the nation. Applicants particularly needed for engineer positions at $2974, $3397 and $4479 a year, and for mining engineer and metallurgists at starting salary of $3397 to $6235 a year. Apply at the United States Civil Service Commission, Washington 25, D. C.

RESEARCH SCIENTISTS: Experienced research scientists with advanced degrees and experience in physics, aerodynamics, thermodynamics, electronics, optics, mathematics, chemistry, metallurgy, or meteorology to perform supervisory research and act as permanent consulting group to engineering laboratories. Excellent opportunity for men with right qualifications. Salary, $8000 to $14,000. Box 4-15.

POSITIONS WANTED

METALLURGIST: B. S. in metallurgical engineering from large midwest university. Six months experience in materials testing of metals. Age 26, single, veteran with 16 months overseas. Desires to locate in Midwest, but will consider offers from other areas. Box 4-20.

WELDING ENGINEER: College graduate, age 31, married. Experience in heavy gage materials including mild, alloy and stainless steels, bronzes and aluminum. Practical research experience. Thoroughly acquainted with electric arc, argon arc, and flash welding production techniques. Seeking permanent position with an East or Midwest concern expanding its welding facilities. Box 4-25.

METALLURGICAL ENGINEERING GRADUATE: Age 25, married, two children. B. S. in June 1949 from large midwest university. Desires a starting position with opportunities leading to technical sales or customer service contacts. However, will consider position in foundry work. Box 4-30.

DIRECTOR OF INSPECTION AND QUALITY CONTROL: Metallurgical engineer, business management. Age 31. Experienced in light and heavy inspection, statistical quality control, process control, costs and production procedures. Good supervisor and contact man. Prefers supervisory position in inspection, quality control or manufacturing. Box 4-35.

METALLURGICAL ENGINEER: June graduate of Rensselaer Polytechnic Institute desires responsible starting position in metalworking industry. Prefers permanent connection with progressive medium-large company that normally promotes from within the organization on competitive merit basis. Age 31, married, children. Five years in A.A.F. Some experience in metallurgical field. Resumé on request. Box 4-40.

JUNE GRADUATE: B. Met. E. at R.P.I. Desires development or operating position in foundry or heat treating plant with opportunities for advancement into production supervision or sales engineering. Age 26, married, member of Tau Beta Pi. Location East or Midwest. Box 4-45.

METALLURGIST-ELECTROCHEMIST: Development, research; 12 years' diversified experience in metal analysis, smelting and refining of nonferrous metals, electroplating and electrolytic processes, metal finishing. Age 37, college man, married. Desires supervisory or development position. Box 4-50.

METALLURGICAL ENGINEERING: Opening desired where following knowledge can be used: graduate engineer; 5 years in production problems and service failures relating to heat treating, forging, welding, casting, forming, stamping and plating; also supervised metallurgical and X-ray laboratories; four years precision casting—ferrous and nonferrous; two years as factory manager. Box 4-55.

AUTOMOTIVE ENGINEER: Chemical, mechanical and metallurgical graduate; mechanical license. Currently department head in engineering division of large automotive corporation. Previously automotive research engineer, project engineer, senior metallurgical engineer (aircraft); chief metallurgist and chemist. Desires chief or assistant chief engineer or equivalently responsible position with progressive organization offering stability and individual opportunity. Box 4-60.

PHYSICIST-METALLURGIST: Extensive training and experience in the management of research and control laboratories. Has had active supervision of physical testing, metallographic, radiographic, X-ray spectroscopy, light spectroscopy, magnetic particle, heat treat laboratories. Trouble shooting on foundry, mill, forge and fabrication problems, both ferrous and nonferrous. Last position—chief engineer with company having foundry, machine, stamping and welding shops. Box 4-65.

METALLURGICAL ENGINEER: Age 24, B.S., Feb. 1949 from large midwestern university. Desires position in control or investigation of manufacturing processes. Major in physical metallurgy, with minors in chemistry and mathematics; also X-ray technology. Box 4-70.

MECHANICAL METALLURGIST: Age 28, married. M. E. degree, Tau Beta Pi. Additional training in metallurgy and electronics. Present work includes development of methods and tool design for the extrusion of nonferrous metals. Main interest in research or development in physical or mechanical metallurgy or applied production problems. Box 4-75.

MECHANICAL ENGINEER — PHYSICAL METALLURGIST: Eight years' diversified experience as metallurgist; instructor in physical metallurgy, metallographer and army ordnance inspector. Age 29, family of four. Candidate for M.S. in June. Capable of supervising physical testing, heat treat, process engineering and chemical laboratories. Will travel anywhere or accept sales engineering position if conditions are acceptable. Box 4-80.

METALLURGICAL ENGINEER: B.S. in metallurgical engineering in June 1949 at midwestern university. Age 25, married. Chemical laboratory assistant for three summers, doing control work. One summer in an experimental foundry. Interested in work that will lead to the position of production metallurgist or sales metallurgist. Box 4-85.

MAY GRADUATE: In metallurgical engineering. Married, veteran, age 29, two children. Some experience as a heat treater and in nonrelated sales. Interested in the fabrication, processing and heat treatment of metals. Desires position as a junior metallurgist. Box 4-90.

FURNACE ENGINEER: Age 32, married, Five years' steel mill and seven years' furnace experience with prominent industrial furnace manufacturer in engineering, design, construction and operation of soaking pits, billet heaters and heat treating furnaces of all types, as well as sales engineering. Desires permanent position as sales engineer or other position for which he is suited. College and engineering background with chief engineering and sales manager's experience. Available June 1. Box 4-95.

METALLURGICAL ENGINEER: Experienced in laboratory techniques, physical testing, heat treating and general plant metallurgy. Varied experience in foundry metallurgy—ferrous and nonferrous. Seven years smelting and refining nonferrous metals. Desires responsible position with progressive small company. Location desired—East, but will consider the Midwest. Married, two children, age 48. Complete resumé of experience on request. Box 4-100.

METALLURGIST: Ph.D. desires position as college professor in physical metallurgy or foundry metallurgy and practice. Experience—four years college teaching, eight years chief metallurgist in steel plant, over three years chief metallurgist in gray iron, malleable and bronze foundry; publications awards. Experienced in research on varied problems. Age 41, married, no children. Prefers Midwest. Box 4-105.

REGISTERED METALLURGICAL ENGINEER: M.S. Specialist in physical metallurgy of weldments involving stainless, dissimilar and low alloy steels. Nine years' experience—six in supervisory capacity, four trouble shooting, customer contacts, publications, lectures. Desires responsible position in Midwest. Box 4-110.

METALLURGICAL ENGINEER: B.S., married, one child, employed at present. Seven years' experience in ferrous and nonferrous fields; control laboratory and production supervision and sound background in related engineering fields. Desires technical sales or production metallurgy. Chicago area preferred. Box 4-115.

HIGH SPEED STEEL METALLURGIST: B.S. from Carnegie Institute of Technology, married, age 31. Six years experience at testing, heat treating, investigational and report work at steel plant specializing in high speed and stainless sheet steels. Box 4-120.

METALLURGICAL ENGINEER: Age 26, married. Graduate engineer. Experience in heat treating, welding, and shop trouble shooting; setting up and operation of modern metallurgical, physical, chemical, and X-ray laboratory; specification and report writing; stress analysis; development and control. Capable of assuming administrative duties in production, engineering or purchasing departments. Prefers West Coast. Box 4-125.

METALLURGIST: M.S. in metallurgical engineering. Age 38. Registered engineer. Experience in all phases of ferrous and nonferrous metal fabrication, heat treatment, forging, metal casting. Over 15 years in plant production, research and development. Numerous publications and patents. Desires position as chief metallurgist, contact metallurgist or research director. Box 4-130.

ENGINEER: B.S. in chemical engineering. Ten years' diversified experience in all phases of laboratory and mill operations of nonferrous metals. Experience includes plant-wide supervision in melting, casting, rolling, drawing, and testing of nonferrous alloys including beryllium alloys. Desires position as assistant to busy executive. Box 4-135.

FORGE SHOP SUPERVISOR: Eleven years' steel mill experience with seven years' forge shop experience on steam hydraulic presses up to 2000 tons capacity and steam hammers up to 10,000 lbs., producing flat, round and hollow work. Extremely wide experience with alloy steels. B. A. degree, age 38, married, two children; employed at present. Box 4-140.

(Continued on opposite page)

RESEARCH METALLURGIST: Sc.D. in metallurgy. Two years in Navy as electronics technician. Research experience in resistance welding, powder metallurgy, high temperature alloys, metal-ceramic combinations. Some teaching experience. Prefers industrial research, but will consider university research or research institute. Box. 4-145.

FEBRUARY GRADUATE: Single, age 26, in good health, excellent school record. Comprehensive training in physical metallurgy, heat treating, and metallography. Is interested in nonferrous research or production work, especially heat treating, welding or powder metallurgy. Prefers Chicago area, but other locations are acceptable depending on opportunity. Box 4-150.

METALLURGICAL SALES ENGINEER OR HEAT TREAT SUPERINTENDENT: Twelve years' diversified experience in ferrous metallurgy of supervisory capacity in heat treating, physical testing, laboratory work, and metallography. Has done consulting, trouble shooting and development. Three years' experience as metallurgical sales engineer directing toolsteel sales. B.Sc. degree, age 40, married. Box 4-155.

METALLURGICAL ENGINEER: Age 24, single, recent graduate of R.P.I. Available for immediate employment anywhere. Particularly interested in research or development in powder metals or high temperature alloys. Box 4-160.

PRODUCTION OR CONTROL METALLURGIST: Experience as metallurgical observer. chemist and metallurgist at steel mill and copper smelter. Now working in South America, but available after Aug. 15, 1949. Prefers Ohio location. Married, two children. Box 4-165.

CHAPTER MEETING CALENDAR

CHAPTER	DATE	PLACE	SPEAKER	SUBJECT
Akron	**May 11**			
Baltimore	**May 10**	Engineers' Club	**H. K. Work**	Some Factors Affecting Behavior of Steel During Cold Work
Birmingham	**May 2**	Hooper's Cafe	**A. N. Kugler**	Welding Metallurgy
Boston	**May 6**	General Electric Co., Lynn, Mass.	**R. H. Aborn**	Martensite and Martempering
Buffalo	**May 12**	Supervisors' Club, Bethlehem Steel Co., Blasdell, N. Y.		Annual meeting
Buffalo	**May 12**	Bethlehem Steel Co.		Annual meeting
Calumet	**May 10**	Phil Smidt & Son, Whiting, Ind.	**F. G. Tatnall**	Physical Testing
Chicago	**May 9**	Furniture Mart.		Science Night
Cincinnati	**May 12**	Terrace Park Country Club		Annual Election & Outing
Cleveland	**May 2**	Cleveland Club	**H. S. Avery**	Abrasion Resistant Alloys
Columbus	**May 10**	Fort Hayes Hotel	**Charles M. Parker**	World Wide Distribution of Steelmaking Raw Materials
Dayton	**May 6**			Annual meeting
Des Moines	**May 10**	Younkers Tea Room	**Harry B. Osborn**	Induction Forging
Detroit	**May 9**	Rackham Educational Memorial		Metallurgical Aspects of Atomic Energy
Eastern New York	**May 10**		**Perry B. Duryea**	Annual meeting
Georgia	**May**			Annual Meeting and Party
Hartford	**May 17**	The Hedges, Britain, Conn.	**E. E. Thum**	Recent Metallurgical Advances
Lehigh Valley	**May 20**	Philadelphia		Tri-state meeting
Los Angeles	**May 12**	Rodger Young Auditorium	**V. N. Krivobok**	Some Phases of Stainless Steel Fabrication
Louisville	**May 5**			Annual meeting
Mahoning Val.	**May 10**	A. M. Byers Co., Ambridge Pa.		Plant Visitation
Milwaukee	**May 17**	City Club		Annual party
Montreal	**May 2**	Queen's Hotel		Annual meeting
New Haven	**May 19**	Hotel Elton, Waterbury	**Alfred V. Bodine**	Looking Ahead With Business and Industry
New Jersey	**May 16**	Essex House, Newark	**John R. Dunning**	Atomic Energy
New York	**May 9**	Building Trades Employers Assoc.	**O. J. Horger**	Relationship of Metallurgy and Design
North West	**May 7**	Minneapolis Athletic Club		Annual meeting
Northwestern Pennsylvania	**May 26**	Erie, Pa.	**H. P. Croft**	Stress-Corrosion Cracking
Notre Dame	**May 11**	Engineering Audit., Univ. of Notre Dame	**O. J. Horger**	Relationship of Metallurgy and Design
Ontario	**May 6**	St. Catharines	**H. B. Knowlton**	Recent Developments in Automotive Steels
Ontario	**June 10**	Hamilton		Field Day
Philadelphia	**May 20**			Tri-state meeting
Pittsburgh	**May 12**	Roosevelt Hotel	**John Chipman**	Another Look at Deoxidation
Purdue	**May 17**	Lincoln Lodge, West Lafayette, Ind.	**I. W. Burr**	Statistical Quality Control
Rhode Island	**May 11**			National Officers Night
Rocky Mountain	**May 20**	Oxford Hotel		Election of officers
Saginaw Valley	**May 17**	Fischer's Hotel, Frankenmuth, Mich.	**L. F. Livingston**	Research and Better Living (Ladies' Night)
Southern Tier	**May 9**	Endicott, N. Y.		Annual Meeting and Home Industries Night
Springfield	**May 12**	Sheraton Hotel	**H. K. Work**	Some Factors Affecting Behavior of Steel During Cold Working
St. Louis	**May 20**	Forest Park Hotel	**Walter Meyer**	Metallizing
Syracuse	**May 14**	Hinerwadel's Grove		Annual clambake
Terre Haute	**May 2**	Student Union, Indiana State	**Charles E. Kircher**	Atomic Energy in Our Everyday Life
Tri-Cities	**May 3**	Rock Island Arsenal Cafeteria	**Waldemar Naujoks**	Modern Forging Practice and Technique
Tulsa	**May 10**	Spartan Cafeteria	**William Adam, Jr.**	Heat Treating in Salt Bath Furnaces
Utah	**May 23**	Provo, Utah		Plant Visitation to Geneva Steel Co.
Washington	**May 9**		**H. K. Work**	Some Factors Affecting Behavior of Steel During Cold Working
West Michigan	**May 16**	Park Congregational Church, Grand Rapids	**Malcolm F. Judkins**	Economic Use of Carbide Tools
Western Ontario	**May 20**	Elmwood Hotel, Windsor	**Norman Cuke**	Flame Hardening
Wichita	**May 17**	K of C Hall		Good Fellowship meeting
Worcester	**May 13**	Hotel Sheraton		New England regional meeting
York	**May 11**	Gettysburg	**V. M. Darsey**	Corrosion

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MANUFACTURERS' LITERATURE

243. Copper Plating

Technical data sheet on Rocheltex, new liquid addition agent which can be added to any cyanide copper plating solution and used in any type of equipment. MacDermid Inc.

244. Corrosion

Technical bulletin No. 3 gives physical and chemical properties and suggested uses of a group of surface active agents known as Alox 350. Alox Corp.

245. Gas Burner

New Mixjector blast torch burner furnishes complete burner and gas-air mixer units that are simple to adjust and control. Get data sheet 2C-1 for complete description. Bryant Heater Co.

246. Gray Iron

Announcing the 50th anniversary of Frankite, an attractive two-color booklet gives a complete picture story of the many and varied uses of "tailor-made" irons in industry. Frank Foundries Corp.

247. Grinding

Announcing a new revised Die and Wear Parts catalog 48-WP. Full prices and data on Talide-tipped centerless grinder blades, sheet metal draw dies, wire and tube dies, drill jig bushings, etc. Metal Carbides Corp.

248. Heating Equipment

"Eclipse Gas Pak" is a complete gas combustion assembly for firing steam boilers, heating plants, industrial ovens, etc. Bulletin H-25 contains installation diagrams, specifications and application photographs. Eclipse Fuel Engineering Co.

249. Lab Furnaces

Two new Leco box type furnaces are fully described in a 4-page leaflet; one designed for use in temperatures up to 2900° F., the other for temperatures up to 2600° F. Laboratory Equipment Corp.

250. Measuring Microscopes

Bulletin 161-48 contains 24 pages describing measuring microscopes for laboratory and shop. Introduction includes information on selection and use. Gaertner Scientific Corp.

251. Metal Engineering Data

New 8-page bulletin gives engineering data including load deflection, air flow comparison, and free openings of both standard and flattened mesh types of expanded steel. Jos. T. Ryerson & Son, Inc.

252. Nozzles, Blasting

Complete series of Super-Titan blasting nozzles with tungsten carbide liners and accessories illustrated in new two-color catalogue. Also special booklets on uses in various industries available on request. Mills Alloys, Inc.

253. Parts, Powder Metal

"Applications and Properties of Nonferrous Powder Parts" is title of educational booklet. First part deals with technical aspects of nonferrous powders; the second half is devoted to case histories. New Jersey Zinc Co.

254. Plating Rack Coating

4-page leaflet describes "Enthonite 101" a new liquid plastic plating rack coating. Material also has extensive use for coatings to resist corrosive organic materials. Enthone, Inc.

255. Press, Hydraulic

Straightening, forming, broaching and assembling operations all competently and economically handled by the new hydraulic metalworking press just developed. Niagara Machine & Tool Wks.

256. Seam Welders

An 8-page bulletin No. 804 describes new line of roller head seam welders which embody three basic sizes for light, medium, and heavy duty work, also available in three types—for circular, longitudinal welding, or both. Progressive Welder Co.

257. Stainless Steels

New booklet describing leading brands of stainless, heat resisting, tool and die steels. Typical analysis and applications included for each brand. Jessop Steel Co.

258. Surface Control

New 8-page bulletin gives numerous practical advantages of shop control for surface roughness and waviness. Write for "More Profits to You Through Surface Control". Physicists Research Co.

259. Tube Furnace

New electric tube furnace especially designed for general research work. Materials can be tested to maximum temperature and cooled quickly. Bulletin gives full description and also typical heating and cooling curves. Harper Electric Furnace Corp.

260. Universal Tester

New Multi-Low-Range universal tester. Bulletin M gives full description of operation with photographs of all parts. W. C. Dillon & Co.

READER SERVICE COUPON

Metals Review, April 1949

Circle these numbers for manufacturers' catalogs described on this page.

243	245	247	249	251	253	255	257	259
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Circle these numbers for information about new products described on pages 61, 62 and 63.

797	799	801	803
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NEW PRODUCTS *in Review*

797. Resistance Wire Alloy

High electrical resistivity and stable resistance values over wide ranges of temperature are properties that make the new alloy known as Karma especially suitable for wire-wound resistors of high accuracy.

The specific resistance of Karma is 800 ohms per circular mil foot (133 microhms per cc.)—more than 2.7 times that of the older copper-base alloys widely used for such resistors. Not only can resistors be smaller—with resultant savings in space and weight—but also more ohms are given per production dollar.

In potentiometers and resistance units used for radio, radar and other electrical equipment, a limiting minimum size is often specified because of the poor mechanical strength of the wire. Because of the higher specific resistance of Karma, however, a larger diameter of wire will give the same resistance per foot. This is an important factor in the design of resistance units, since heretofore no alloy combined high specific resistance and low temperature coefficient of resistivity.

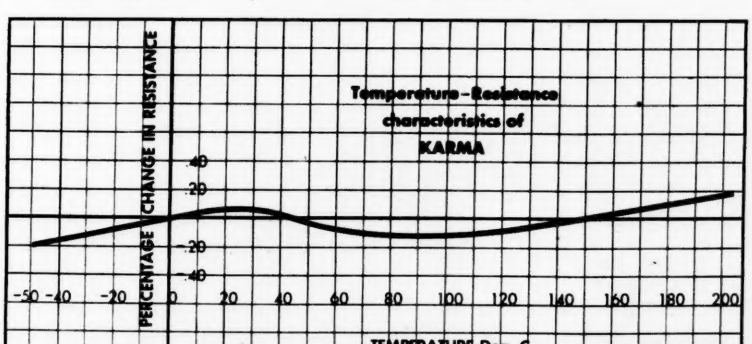
This low coefficient of resistance remains constant over a wide temperature range, so that the material is especially adapted for service in precision resistors subjected to temperature extremes, such as in laboratory research and airplane equipment.

The thermal emf. value for Karma agaist copper is only 0.002 millivolt per °C. between 0 and 100° C.—a figure that confines error due to voltage generated to negligible proportions.

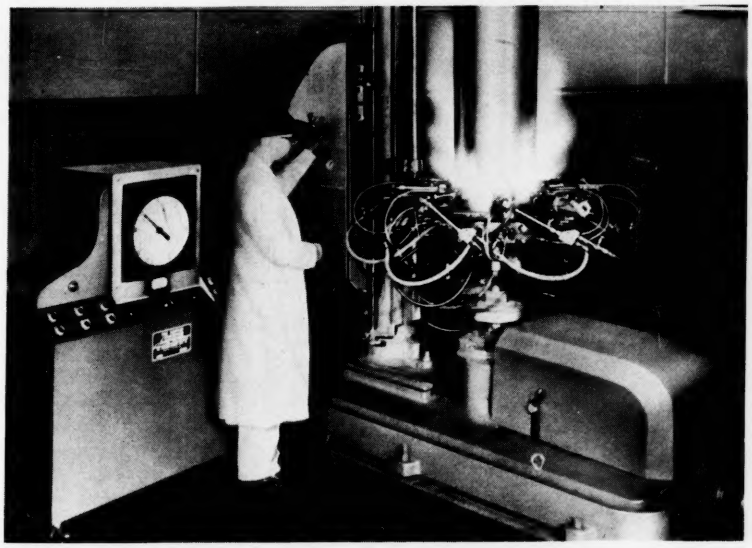
In addition to its outstanding electrical properties, Karma (with a tensile strength at room temperature of 130,000 to 180,000 psi.) affords physical advantages over the commonly accepted copper-base alloys.

Since coefficient of linear expansion is only 0.000014 per °C. between 20 and 500° C., windings employing Karma are less liable to be affected by distortion or movement.

For further information write Miss G. V. Corbett, Driver-Harris Co., Harrison, N. J., or use coupon on page 60, circling No. 797.



798. Flame Hardening Service



The Denver flame hardener—a new automatic, electronically controlled machine—has been installed by Lakeside Steel Improvement Co. to broaden its steel treating service to a greatly extended range of shapes and sizes. This machine, the only one of its kind in the area, provides control for all four perfected methods of flame hardening—rotary progressive, vertical progressive, spinning and combination. For further information write C. W. Derhammer, Lakeside Steel Improvement Co., 5418 Lakeside Ave., Cleveland, Ohio, or use coupon on page 60, circling No. 798

799. Heavy Lubricating Grease

A new aluminum-soda base grease with an exceptionally high melting point is designated Sta-Put 18H-2. It is especially recommended for industrial or automotive applications requiring a heavier grease than Houghton's original Sta-Put 18H; for large, heavily loaded presses (particularly older equipment where bearings are worn); for heavy-duty applications in contracting, mining and dredging equipment; and for hoists, cranes and similar industrial applications.

The main advantage of the new grease is that, while it is a heavy waterproof lubricant, it possesses a melting point 100 degrees higher than a straight aluminum-type grease. It is a transparent green in color.

For further information write D. C. Miner, E. F. Houghton & Co., 303 West Lehigh Ave., Philadelphia, Pa., or use coupon on page 60, circling No. 799.

NEW PRODUCTS *in Review*

800. Chemical Polish

Iridite Metcote is a chromate-type chemical polish for producing a lustrous, corrosion resistant surface on copper, brass or bronze. Applicable to sheet, rod, castings or forgings, it serves the triple purpose of brightening, improving tarnish resistance, or a paint base.

The coating is applied by a short, nonelectrolytic dip at slightly elevated temperatures. Production rates may be increased by raising the temperature of the bath. Work to be processed should first be thoroughly cleaned in standard plating shop solutions. After rinsing, the sequence of operations is: Iridite Metcote, rinse, optional bleaching dip and rinse, hot rinse and dry. Tests indicate that the coating thus produced shows marked superiority in salt spray to ordinary brightening processes. The work is chemically polished and does not become etched, even after long immersion.

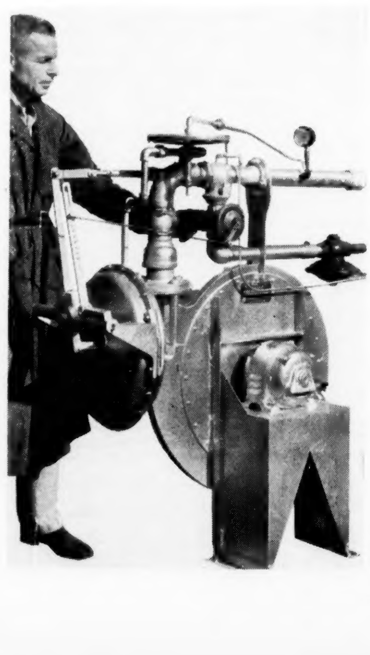
For further information write H. C. Irvin, Allied Research Products, Inc., 4004 East Monument St., Baltimore 5, Md., or use coupon on page 60, circling No. 800.

801. Gas-Air Mixer

Low initial cost and low upkeep are among the advantages offered by Consta-Mixer, a new gas-air mixer. Turndown range is 8 to 1. The Consta-Mixer maintains a constant manifold pressure to any number of burners regardless of variations in burner requirement, within the capacity range of the machine. It handles all types of gas from LP (butane or propane) to manufactured, and can be arranged for high-low operation.

Consta-Mixer is available in three sizes, with capacities ranging from a minimum of 35,000 B.t.u. up to 2,000,000 B.t.u. No special foundation is required, and the existing air supply can be utilized when available. Otherwise, a turbocompressor is included which is designed to furnish a steady, nonpulsing supply of combustion air.

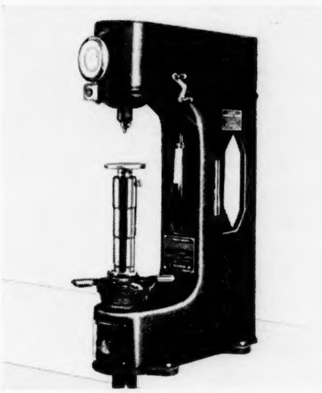
For further information and literature write Mrs. Mark Bates, Vapofier Corp., 10316 South Throop St., Chicago 43, Ill., or use coupon on page 60, circling No. 801.



NEW PRODUCTS *in Review*

802. Rockwell Tester

A new and improved Rockwell Hardness Tester offering unprecedented ease and simplicity of servicing is identified as Clark hardness tester Model C-8A, C-12A, and C-16A. It



features a spindle housing and beam assembly that may be replaced by the owner himself without requiring special skill or special tools. Owners of the new instrument, therefore, will be able to renew or recondition their instruments in their own shops.

Other advantages include a frictionless spindle, more positive tripping, and exceptionally light weight. The body of the tester is cast in aluminum, and weighs from 65 to 85 lb. less than similar units made from steel or cast iron.

The frictionless spindle is an exclusive Clark feature that assures a correct minor load every time. Positive tripping overcomes the danger of an incorrect major load being caused by friction or drag of the tripping lever on the loading beam.

For further information write C. W. Clark, Jr., Clark Instrument, Inc., 10200 Ford Rd., Dearborn, Mich., or use coupon on page 60, circling No. 802.

803. Carbide Comparison Chart

A recently revised "Comparison Chart of Cemented Carbide Grades" gives full information covering the equivalent grades of tungsten carbide manufactured by all established producers.

The chart shows (*a*) the type of material for which each grade is suitable; (*b*) characteristics and uses of each grade; (*c*) approximate Rockwell hardness on the "A" scale, and (*d*) standard and special equivalent grades of manufacturers under appropriate classifications.

This information is tabulated on a form suitable for inserting into a three-ring notebook or posting on the wall.

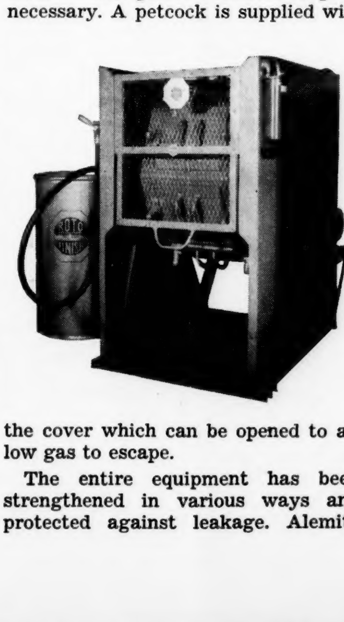
For copies of this chart write Edward L. Dreyer, Adamas Carbide Corp., 1001 South 4th St., Harrison, N. J., or use coupon on page 60, circling No. 803.

804. Burnishing Barrels

Redesigned burnishing barrels of the Mercil type embody a number of important improvements. Both the No. 1 and the No. 2 Mercil burnishing barrel units are now being supplied with a reducer-type direct-connected drive with motor, thus eliminating spur gears. This means quieter and more efficient operation.

Three roller bearings in a supporting ring have been placed under the barrel at the forward end, which helps alignment and serves to distribute the weight of the load over the entire barrel. This reduces horizontal stresses on the main shaft as well as on the barrel and cover shaft. With the main shaft diameter increased, the possibility of shearing due to tension stresses is eliminated.

The internal gear is fastened to the bottom of the barrel from the outside, thereby eliminating the necessity of removing the wood lining blocks when gear or shaft change is necessary. A petcock is supplied with



the cover which can be opened to allow gas to escape.

The entire equipment has been strengthened in various ways and protected against leakage. Alemite fittings now replace the old-style grease cups, and the BX conduit between the switch box and the motor has been replaced with neoprene rubber-covered cable, an important safety feature.

For further information write Lewis Hague, Hanson-Van Winkle-Munning Co., Matawan, N. J., or use coupon on page 60, circling No. 804.

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